THE RUBBER AGE

ESTABLISHED 1917

COVERS ALL PHASES OF THE PRODUCTION AND MARKETING OF CRUDE RUBBER AND THE MANUFACTURE AND DISTRIBUTION OF RUBBER GOODS

Vol. 33 SEPTEMBER, 1933 No. 6

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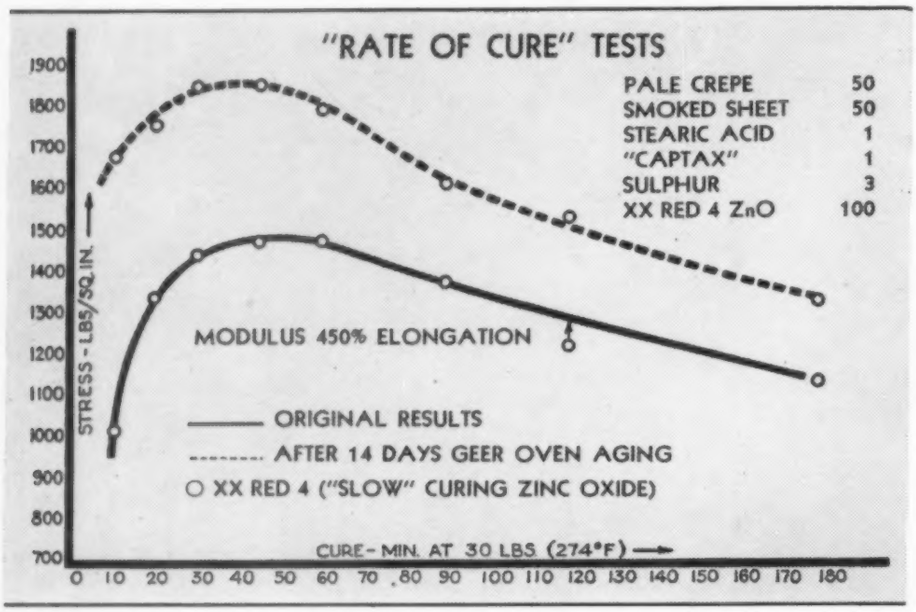
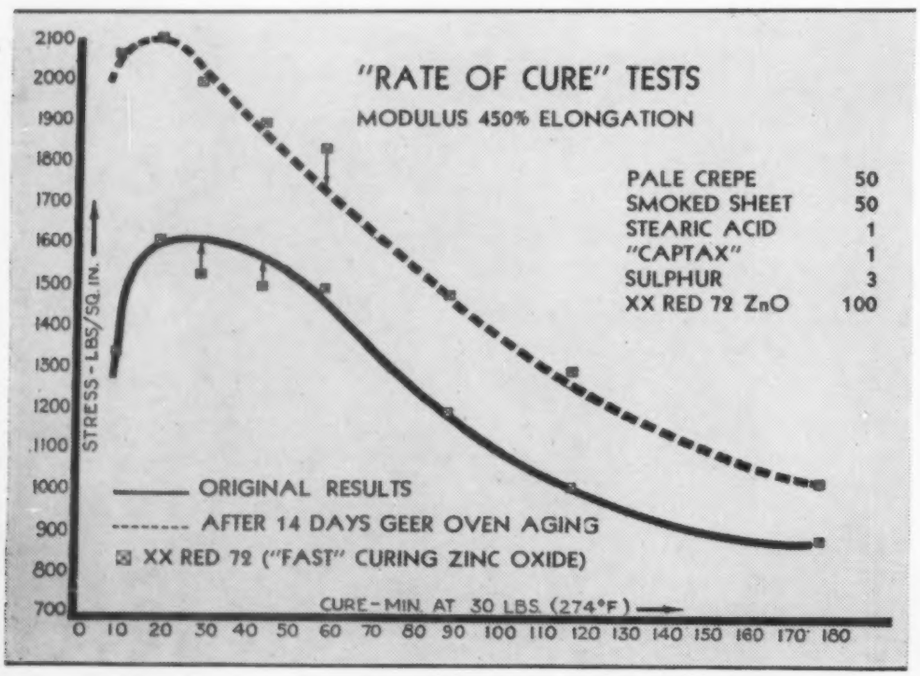
The New Jersey Zinc Company 160 FRONT STREET NEW YORK





No. 19 of a series of charts showing a comparison of "fast" and "slow" curing zinc oxides with typical accelerators.

The effect on MODULUS of "SLOW" (XX Red 4) and "FAST" (XX Red 72) CURING Zinc Oxides in a CAPTAX Stock

New Jersey Zinc

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Is RUBBER RESTRICTION In the Offing?

Writer Believes That, Despite Current Talk, Conditions Are Against Serious Consideration of Restriction

By JOHN P. BUSHNELL

THE rumor of rubber restrictions crops up again,—this time with something on which to base these rumors. The bugaboo of restriction has always been one of the uncertain factors in any market analysis of the crude rubber commodity. It is no wonder that in the last five months the average price rise was over 5 cents, with three uncertain factors on the speculative side of the market. These three factors were:

1. Dollar inflation.
2. Greater consumption in the United States.
3. Restriction.

Since Great Britain went off the gold standard the Dutch Government in the D. E. I. has been hard pressed. Direct evidence of this is seen in the drop in the native rubber areas in the Dutch colonies. The depreciation in the Singapore market for dry rubber has caused a large area to go out of production temporarily, the natives reverting to growing other essential foodstuffs such as rice and other agricultural necessities.

While the July consumption within the United States was a trifle less than that of June, it actually meant had the 4th of July been a working day, July would probably have topped 1933 from a consumption standpoint. It is problematical, even under the NRA program, whether rate of consumption of 50,000 tons per month can continue to the end of the year, but it is interesting to note that in the last seven months the United States has consumed 232,500 tons of rubber, this being 24,000 tons more than for the consumption figure over the corresponding seven months in 1932.

Thus the statistical position of the raw rubber commodity has vastly improved over its position a year ago, when there were practically 600,000 tons of stocks on hand. Stocks in London and Liverpool have shown a persistent decline, most of this tonnage going presumably to European markets.

It has always been the spectre of rubber restriction that has thrown monkey wrenches into the commodity market, not only in New York, but in London and Amsterdam, not to speak of Ceylon and Singapore and Penang. Great Britain has already tasted bitterly at the expense of the Dutch under the old Stevenson Restriction Act. International economists are almost as one against artificial barriers proposed by government regulation.

As before stated, with Great Britain off the gold standard, the Dutch rubber planters find themselves in a very precarious position. On one hand, any rise in the price of the commodity might produce native rubber in such proportions as to drive down the market price for estate rubber. As a consequence the British planters in Malaya have a strong weapon in their hands over their Dutch friends. However, the rubber planting industry in British Malaya is very much divided in its sentiment. It looks back over a period of six years of hectic inelasticity. We see such men as Sir Eric Geddes and the Dunlops resisting all attempts at restriction measures, while Mr. Eric Miller is convinced

that the plantation industry cannot long survive without some artificial restraint on production. It is the old argument of supply and demand in which a balance between consumption and production is a consummation devoutly to be wished but such a balance is the old economic Utopia dreamed over again.

It is an even bet that the trade will never see restriction practiced.

Tentative Proposals Discussed

In spite of the glowing accounts of an Anglo-Dutch agreement, latest inside details would indicate that flies have gotten into the ointment. At a meeting of the International Association for Rubber Cultivation in the Dutch East Indies (the equivalent of the Rubber Growers Association in Holland) it is understood that tentative proposals were discussed but were referred back to local planter associations. Considerable secrecy surrounds the negotiations of the Anglo-Dutch Committee but it is believed that the tentative proposal for restrictive output will be based on 30% restriction of the 1929 production.

We have yet to hear officially the attitude of the British Government and the Netherlands Government. In the face of what has transpired in the past as between these two governments over this same question of restriction this certainly must be a delicate question for their respective Foreign Offices to handle.

But there has now been injected into the international squabble a French protest which carries Government opposition to any form of control. Of course, French Indo-China is the only rubber area in the east and so far has been very small, but the industry has been carefully fostered by the French Government and planting and production have been increasing lately. Shipments for 1932, for instance, totalled 14,000 tons compared with 12,000 for 1931 and 7,600 tons for 1930. In fact, during the era of depression the French Government subsidized the rubber producers in Indo-China.

The question in any discussion of a problematical restriction program is what can be gained by it. With NRA a definite factor in our own economic and industrial program it might not be amiss to contemplate on some form of stabilization of price for crude rubber.

For instance, with any restriction proposal a pivotal price would have to be established based on a fair cost of production and following in line generally with the spirit of the NRA code idea. It would be interesting to note at this stage of the game and in view of our other international complexities, such as bi-lateral tariff arrangements, just what price to the American rubber manufacturing industry would be considered equitable to the planter and the manufacturer alike.

Larger Acreage in Bearing

Another factor militating against restriction is the enormous potential area coming into bearing. It is almost inconceivable to believe that from an estimate of 4,715,000 acres in bearing in 1929, the area is now estimated at over 7,000,000 acres. Much of this is native rubber and difficult of any form of restriction. There are other international factors which may seriously thwart any attempt at restriction, namely: the postponement of the London Economic Conference, which voiced its sentiments in favor of a suspension of any restraints, certainly during the life of the possible Conference.

The Dutch Government colonial policy in the Dutch East Indies has been to encourage native planting of rubber and other crops and it would be a severe blow to the prestige of the Colonial administration if this policy could not be kept up. Disastrous as it has been, during the falling rubber market, native rubber has kept pace month by month and while no general direct increase, due primarily to the low prices prevailing for the commodity, the natives would have tapped a tonnage that would probably be a surprise to the rubber trading world. Tapping on price risings is the custom with the natives and idle trees stand when prices go below what the native can make off his copra and rice.

In this whole attitude on a revival talk of restriction the sudden change of front of a Dutch planter is significant. It is easy to understand why the Netherlands Government resisted any previous restriction policy because of the encouragement they gave the native planters as already mentioned. But this time the sentiment for restriction apparently comes from the Dutch estate interests. The drop in the gold exchange and the precipitous fall in rubber down to five months ago made the canny Dutch burghers wary of their gilders and their responsibility to their stockholders.

Thus with stocks on hand and afloat there is every reason to envisionage a supply of a raw commodity greatly in excess of any demand over the next twelve months. Restriction won't help the situation and there are too many factors in the economic picture which are militating against any concerted action on the part of the governments involved and the planters themselves. In the light of all things considered it is extremely doubtful if restriction is taken seriously in the new conversations held between the Anglo-Dutch Committee at Amsterdam.

PRICES, PRODUCTION AND CONSUMPTION*

	Average Price of Rubber in London	Average World Production Estate tons	Monthly Production Native tons	Total tons	Average World Absorption U. S. A. tons	Rest of World tons	Total tons
1929	10¼d.	42,300	27,200	69,500	39,200	28,100	67,300
1930	5⅞d.	41,700	25,100	66,800	31,500	28,200	59,700
1931	3 1/16d.	40,500	24,700	65,200	29,100	27,400	56,500
1932	2⅝d.	38,000	20,400	58,400	26,100	29,200	55,300
1933—Jan./Mar.	2 5/16d.	40,200	19,800	60,000	20,100	35,400	55,500
April/May	2 11/16d.	39,900	24,200	64,100	35,400	34,200	69,600
June (est.)	3 7/16d.	42,500	28,500	71,000	50,000	34,000	84,000

*Manchester Guardian Commercial—July 8, 1933.

Latex As Plywood Adhesive

AMONG the problems which the Technical Department of the International Association for Rubber in the Netherlands Indies was asked to investigate during 1932, according to the annual report of the Association for that year, was that of the suitability of latex to replace casein, etc., as an adhesive in the manufacture of plywood. The report states:

"According to the information received, the joints obtained with latex would resist moisture better than those obtained with the usual adhesives. Our experiments enable us to confirm this opinion only with certain reservations. The experimental data obtained, which will be published shortly, showed that plywood made with latex without vulcanization did not comply with the specifications of the draft standard sheets V 535, V 536 and V 537 of the Main Committee for Standardization in the Netherlands. When the latex was vulcanized during the adhesion process, better results were obtained. Although in dry condition the plywood did not comply with the specifications, the joint resisted moisture to such an increased extent that the plywood complied with the specifications of the moisture test. This greater resistance to moisture could be expected, as it is a well-known fact that vulcanized rubber absorbs moisture to a less extent than the raw material."

The Development and Manufacture of HIGH PRECISION GEARS

By W. E. SYKES

Consulting Engineer, Farrel-Birmingham Company, Inc., Buffalo, N. Y.

SUPERFICIAL consideration may lead to the conclusion that this subject is of little interest to rubber technologists, but actual experience proves that a full comprehension of the merits and capacity of present day precision gears makes possible the success of many new processes which otherwise would be impracticable. Many manufacturing methods have proved unworkable due to the limitations of gears of the old type.

A gear wheel is one of the oldest machine elements and one of the most indispensable ones. It is difficult to imagine how the mechanical age could survive if gears were not available.

An engineer with imagination, especially one who makes gears, designs them or operates them, will at least once in his career, probably many times, ask "Why not eliminate gears?" He will get the notion that they are old-fashioned, sometimes troublesome, and think, "Surely there is an alternative."

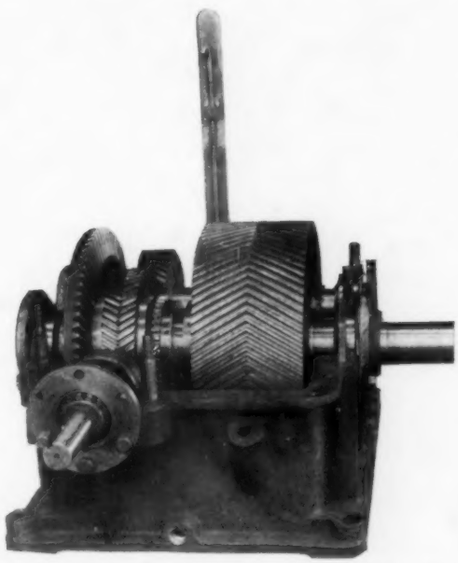
Gears connect shafts for the purpose of transmitting power from one to the other and in addition they are usually required to transform the speed from that of the driving shaft to the required speed of the driven shaft. What are the alternatives? Belts, chains, ropes and friction discs or friction pulleys are the most obvious. Each has its uses and each has its disadvantages and limitations. Then we turn to non-mechanical means. Hydraulic transmission of power is feasible. We have many forms of hydraulic motors, but they are inefficient and expensive to manufacture. We have pneumatic transmission. It is useful for certain purposes but it also is inefficient and its prime and secondary movers are expensive to manufacture. Another alternative is electric transmission with similar disadvantages and limitations.

Tooth gear wheels for transmitting power and for transforming motion were used by the ancients. In those times the prime movers or sources of power were humans or animals. Later the energy of wind and falling water was used for doing work; and in the course of time the machine age commenced. As a consequence the development of toothed gearing for transmitting large powers became a necessity.

Wooden gears were used first and some of these can still be found in disused windmills; probably some are still in use. The teeth of such wheels were crude in design.

In 1769, at the Carron Iron Works in Scotland, cast iron was first used in mill work, according to Professor Robert Willis, who quotes as his authority, "Farey on the Steam Engine," and soon afterwards it was used for large cog wheels.

Cast tooth gears were developed intensively over a century and a half. Greater skill in workmanship and an exact knowledge of the laws governing tooth shapes were acquired. First the teeth were molded from wooden patterns. Later indexing molding machines were invented which used a tooth-block comprising a block of wood in which one or more teeth were formed. This tooth-block was secured to an arm adapted to revolve on an axis and controlled by a dividing or index wheel, thus ensuring truth of the gear tooth mold and the elimination of errors due to the warpage of a wooden pattern. Still later metal patterns for small and medium size wheels were used. At the present time a great number of metal molds are used for making die cast gears, but they are limited to small sizes.



Two-Speed, Right Angle Drive Unit With Two Pairs of Farrel-Sykes Continuous Tooth Herringbone Gears and One Pair of Bevel Gears

During the era of cast tooth gears one member of a gear pair was often made with wooden teeth to secure quieter operation. The wooden teeth were mortised into the iron rim, cored slots being provided for the purpose. Mortise gears, as they were called, are still in use. Wooden teeth had to be replaced frequently so that a full spare set was kept on hand.

Straight tooth gears, both bevel and spur type, were first in vogue but helical gears were invented as early as 1666, although they do not seem to have come into practical use until early in the Nineteenth Century.

Then, single helical gears were used, and subsequently double helical or herringbone gears were developed. Of course, they all had cast teeth.

Single helical and double helical bevel gears were the next application of the same principle.

Skew bevels, also known as hypoid gears, were used sixty or more years ago, mostly in textile machinery.

The development of gears with machine cut teeth commenced about the middle of the last century and became intense during the decade 1880-1890. The intensity has increased and shows no sign of abatement.

Having now dealt briefly with the early history of the subject we can pass on to information of practical importance at the present time.

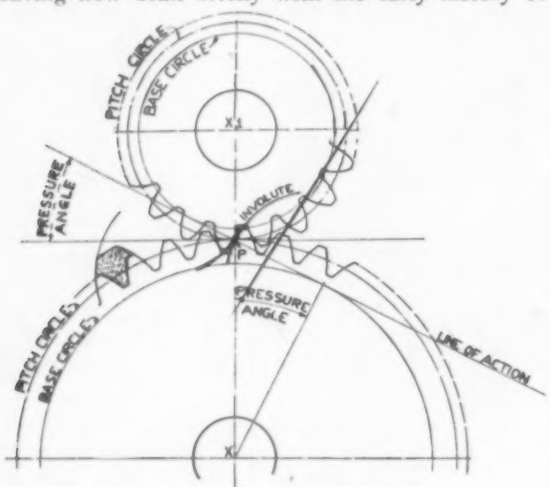


FIG. 1

Design

In Fig. 1, X and X_1 are shafts which we require to connect by means of gears. Their axes are parallel and lie in a plane. Shaft X is required to make one revolution while shaft X_1 makes two revolutions; therefore, the ratio is as 2 is to 1 or as 1 is to 2. Manifestly one gear must have twice as many teeth as the other and the pitch of teeth which mesh together must be the same if we require uniform transmission of motion.

Where to measure the pitch must be ascertained and we have, therefore, to determine the pitch circles. A little consideration shows that they must be in the same ratio to each other as the numbers of teeth; the pitch circle diameter of the gear on shaft X must be twice the diameter of the pitch circle of the gear on shaft X_1. Therefore, both pitch circles must pass through a point "p" situated twice as far from the axis X as from the axis X_1. This point "p" is termed the "pitch point" and through it we draw the pitch circles.

The Pitch Point and the Pitch Circles

The position of the first depends on the position of the axes and the ratio of the number of teeth in one gear to the number of teeth in the other. And the diameters of the pitch circles depend upon the distance between the axes and the ratio of the number of teeth in each gear.

The General Law Governing Tooth Curves

The correct form of tooth curve has been investigated by many able mathematicians and eventually the law governing it was evolved. It is often stated as follows: "The common normal to the tooth curves at the point of contact must pass through the pitch point." It is not proposed to prove this law here; many authors have given proofs which vary considerably in method or form but they are all sound.

Investigation has shown that an infinite variety of curves will obey the law of tooth curves and further investigation has shown that one particular curve—the involute—has characteristics which make it the most suitable. The most important characteristic of the involute curve is that the axes may be moved nearer or farther apart within practical limits without destroying the correct action or without departing from the law of gear tooth curves. No other tooth curve possesses this most valuable practical characteristic and nearly all gears made at present have teeth with involute curves.

Base Circles and Pressure Angles

Involute curves are developed from base circles as shown in Fig. 1. The diameter of the base circles may be chosen arbitrarily within fairly wide limits but in a gear pair they must be in the same ratio as the pitch circles. The diameter of the base circles relative to the diameter of the pitch circles determines what is termed the pressure angle. Fig. 1 clearly defines the pressure angle and, therefore, no written description is necessary.

The pressure angle offers much scope for discussion. An angle of 14½ degrees was the first standard used but now 20 degrees is preferred. It is a compromise but proves reasonably good in practice. 22½ degrees would be better on the whole.

From Fig. 1 it can be observed that the full length of the involutes or any portion of them between the base circles may be used as tooth curves. It has been common to take an equal amount outside and inside the pitch circles as in Fig. 2. This is known as the equal addendum system; the diagram shows what is meant by addendum and dedendum. Fig. 3 shows unequal addenda, and Fig. 4 shows a condition where all the tooth curve on one gear is within the pitch circle and all the tooth curve on the other outside the pitch circle. All of these are kinematically correct but the unequal addenda of Fig. 3 is now generally considered best. But gears made as in Fig. 4 are in practical use and for some conditions and applications they have advantages.

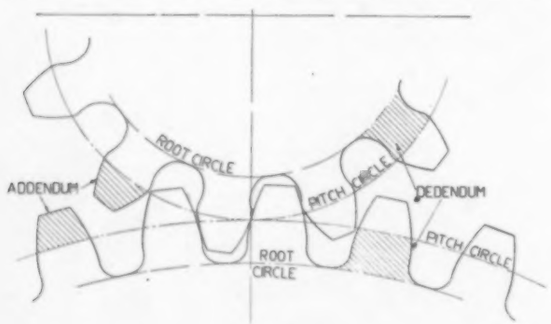


FIG. 2

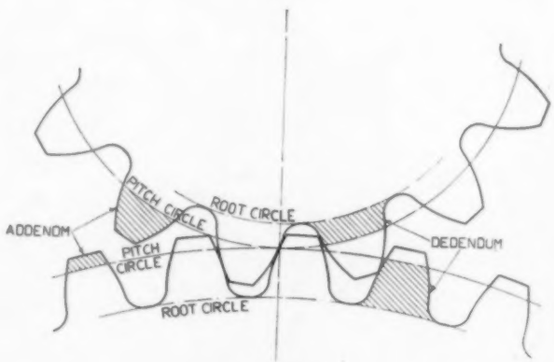


FIG. 3

Pitch of Teeth

The "pitch" of teeth is referred to in various ways. The following terms are used. "Circular pitch," "diametrical pitch," "normal pitch," "base circle pitch," "module pitch," "chordal pitch" and "axial pitch." Fig. 5 explains these.

Gears for connecting shafts, the axes of which are disposed at an angle to each other, are known as bevel gears when the axes intersect; skew bevel gears when the axes do not intersect. Spiral gears, and worm gears, belong to the same family and have similar characteristics.

Ball Bearing Analogy

Gears with parallel axes and bevel gears with intersecting axes are distinct from the other types in that the sliding action between the contracting tooth curves is less in proportion to the peripheral speeds; in fact, the sliding velocity is so small that the action is analogous to that of a ball bearing. In a roller bearing the action is purely rolling except for the disturbances caused by deformation of material under load. In ball bearings there are pitch circles where rolling takes place; but where contact takes place other than at the pitch circles there is a slight rubbing action.

Comparison of Helical Gears and Straight Tooth Gears

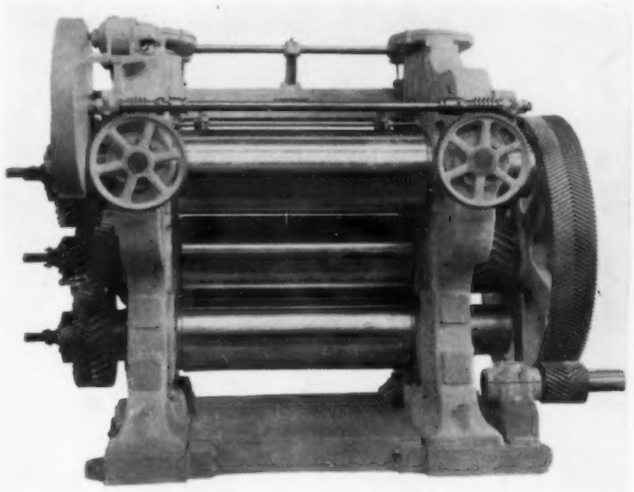
Reference has already been made to helical gears and herringbone gears. In straight tooth gears the tooth contact changes starting near the root of the teeth of the driving gear and at the outer end of the driven gear, and it changes as the action proceeds so that at certain phases of action it is near the center of the tooth contour. In addition the whole tooth comes into contact suddenly and goes out of contact equally abruptly. As a result the total length of contact fluctuates as much as 50 per cent. But there is, in a practical sense, a worse condition which is caused by unavoidable small errors in pitch. These may be, in the highest class gearing, only .0001″ to .0003″, yet the effect at high speed is noise and vibration; the latter resulting in rapid wear due to fatigue and disintegration of the material.

Helical gears have teeth which take a helical trace or a screw path and their lines of contact in involute gears, which are the only ones we need consider, are a straight line disposed at an angle to the axis instead of parallel to the axis as in straight tooth gears. As a result all phases of contact occur simultaneously and continuously, providing the helix is sufficiently steep in proportion to the face width and the circular pitch. Another way to express the same meaning is to say; the face width should be more than the axial pitch, preferably it should be more than twice the axial pitch.

Helical Angles

Single helical gears were first made with a small helical angle; 7 degrees or 7½ degrees was common; 15 degrees soon came into use. But now, due to the extensive use of helical gears in automobile transmissions and the demand for silence, much greater helical angles have become general. In some automobile transmissions a helical angle of more than 45 degrees is used. Nearly all gears used for that purpose have a helical angle of more than 30 degrees.

It is easy to understand that single helical gears of high angle set up a heavy end thrust; and great care in the application of thrust bearings has to be exercised.



Calender Equipped With Farrel-Sykes Continuous Tooth Herringbone Gears

Double helical gears (usually called herringbone gears) have opposed helices. With correctly made and accurately mounted herringbone gears there is no end thrust because the thrust of one helix balances the other. No thrust bearings are required; and consequently nearly all heavy drives have herringbone gears.

Single helical gears are (in automobiles particularly) extensively used in this country. But, in Europe, even for automobile transmissions, herringbone gears have displaced them. And the tendency in this country is towards herringbones for automobile transmissions as well as for other purposes.

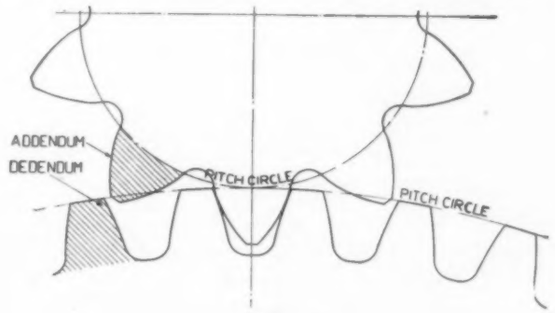


FIG. 4

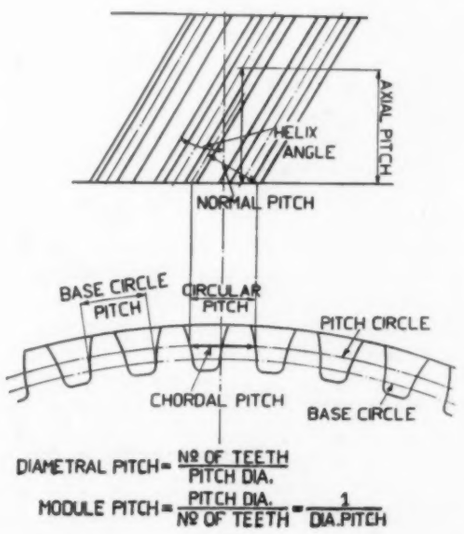

AXIAL PITCH
HELIX ANGLE
NORMAL PITCH
BASE CIRCLE PITCH
CIRCULAR PITCH
PITCH CIRCLE
CHORDAL PITCH
BASE CIRCLE
DIAMETRAL PITCH = Nº OF TEETH / PITCH DIA.
MODULE PITCH = PITCH DIA. / Nº OF TEETH = 1 / DIA. PITCH

FIG. 5

Materials for Gears

A great variety of materials are used. Wood and cast iron have already been referred to. Steel is most widely used. Non-ferrous alloys are common, especially for worm gears, in which one member of the pair is generally made of a non-ferrous alloy and the other forged steel, often case hardened. Rawhide and bakelite are largely used for pinions, mainly with the ooject of securing quiet operation in spite of indifferent workmanship or design. The use of soft materials is a matter of expediency, because hardness combined with toughness and strength is the prime requisite when efficency, economy and durability are desired. But precision is more necessary than hardness.

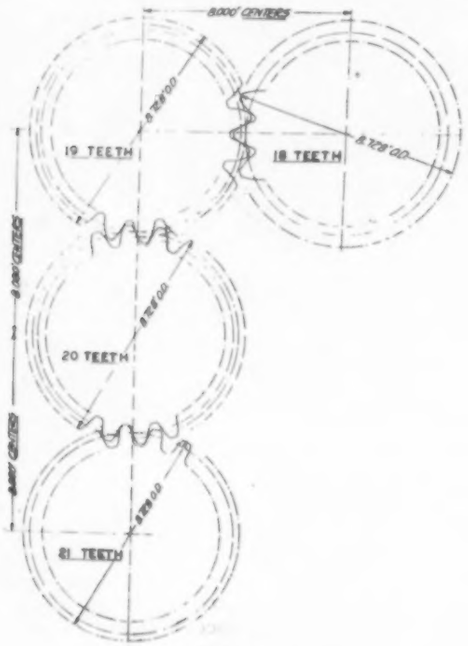


FIG. 6

The foregoing remarks on the subject of materials are intended to show that, in general, hard materials are preferable and also that certain limitations govern the choice of materials. But emphasis is again made on precision, which is the paramount requirement.

The best practice in rubber mills and calenders is to use relatively hard materials for pinions. Steels of a Brinell hardness of 250 to 275 for pinions and 190 to 220 for wheels can be cut after heat treatment, and such a combination gives very satisfactory results, because the requisite degree of precision is not impaired by a furnace heat and subsequent quenching.

The new refined irons, such as Meehanite, are excellent for wheels. They are hard and strong and have remarkable resistance to wear.

Limitations

Toothed gears have certain interesting limitations which must be taken into consideration when selecting materials for their construction.

In worm gears, for example, the power transmitting capacity is limited to less than 250 h. p. If the speed in revolutions per minute is low, the size works out too large for any existing manufacturing facilities, besides being too expensive. If the speed be high enough to result in low tooth pressure the rubbing velocity is too high for adequate lubrication.

In bevel gears with helical teeth the width of face is limited to a certain proportion of the cone distance. In straight tooth gears the limit of pitch line speed is found in practice to be 2,000 feet per minute. For high speeds the required degree of precision costs too much. Herringbone gears are operated at pitch line speeds up to 12,000 feet per minute and higher speeds are permissble if required.

At such high speeds soft weak materials cannot be used due to stresses set up by centrifugal force.

There are also limitations with reference to lubrication. At speeds over 2,700 feet per minute oil should be sprayed on the gear teeth near the zone of contact because if the gear teeth are permitted to dip in oil much power is lost by churning the oil, which results in the generation of heat and a rapid loss of lubricating value of the oil. There are, however, examples of gears running in oil at speeds up to 4,000 feet per minute but that is not good practice.

An interesting application of herringbone gears is shown in Fig. 6. The flexibility of the involute system is strikingly depicted. These gears are for connecting calender rolls of equal diameter, but with differential surface speeds. Each gear has the same outside diameter and the same center distances but the pitch diameters and the number of teeth are all different; two of the gears have each two pitch circles.

Load Carrying Capacity of Gears

Due to the developments in alloy steels and the improvement in manufacturing technique, gears of any given size may be made to carry loads twice as large as were possible ten years ago.

Within the last few years the maximum load carrying capacity of gears has been more accurately determined and it is now recognized that it depends almost entirely on the resistance to wear. Present day precision gears do not break when they are made large enough to resist permanent deformation of the tooth contours providing the teeth are herringbone.

The question is often asked, "What is the relative strength of herringbone gears and straight tooth gears?" The answer is given above for one particular example. In general, herringbone gears compared with straight tooth gears, have twice the resistance to breakage and 12 to 25 per cent more resistance to wear.

All the published formulae on the strength of gears, except a few recently published, are now obsolete. Many of the published formulae are responsible for a large proportion of gear wear, but most gear trouble is due to inaccuracy in manufacture or installation; some is due to defective lubrication.

The Installation of Gears

Only a few notes are permissible on this subject due to space limitations. And only a few are necessary.

Shafts should be mounted in rigidly supported bearings and shaft journals should be true. The wheels should run true on the shafts. Alignment of shafts should be sufficiently precise to ensure that the teeth take a perfect bearing.

In general more blacklash than necessary for running clearance is undesirable though not always objectionable. In some special cases no appreciable backlash is permissible; and present day precision gears meet such requirements.

Lubrication

When the peripheral velocity is approximately 1,000 feet per minute a suitable lubricant has a viscosity of 1,500 to 2,000 Saybolt at 100 degrees Fahrenheit, and such

(*Continued on Page* 260)

Rubber Division Meeting at Chicago

Meeting of Rubber Division, A. C. S., Included 18 Papers and Symposium on "Progress of Rubber Chemistry"

THE Fall meeting of the Rubber Division, A. C. S., was held in Chicago in connection with the Eighty-Sixth meeting of the American Chemical Society during the week of September 10-15. Inasmuch as this issue of THE RUBBER AGE went to press while the Rubber Division meeting was in progress, no report is available on any business transacted at the meeting, such as election of officers and report of the Secretary-Treasurer but a complete report will be included in our next issue. The sessions of the Rubber Division were held in the South Ballroom of the Hotel Stevens beginning Monday, September 11, at 1 P. M. At this first session a Symposium on "Progress of Chemistry in the Rubber Industry" was presented, consisting of four papers by recognized rubber technologists. The titles and authors of these papers appear below.

On Tuesday, September 12, two sessions were held, six papers being presented at each of the morning and afternoon meetings. On the evening of the same day, the banquet of the Division was held in the "Bal Tabarin" of the Hotel Sherman. Wednesday was a day free of meetings, during which members and guests availed themselves of the many opportunities offered to visit the World's Fair and other points of interest in Chicago. The final session was held on Thursday morning, September 14, when six papers were presented followed by the business meeting. Titles, abstracts and authors of papers, with the scheduled time of presentation follow:

DIVISION OF RUBBER CHEMISTRY

L. B. SEBRELL, *Chairman;* H. E. SIMMONS, *Secretary*
C. W. CHRISTENSEN, *Sergeant-at-Arms;* CARL FRICK, *Local Assistant*

Meetings held in South Ballroom, Hotel Stevens

MONDAY AFTERNOON—September 11

Symposium on Progress of Chemistry in the Rubber Industry

1:00—A Review of the Structure of the Rubber Hydrocarbon
Harry L. Fisher and Roscoe H. Gerke

2:00—The Mechanism of Vulcanization
Ira Williams

3:00—Fillers and Reenforcing Agents
Norman A. Shepard, John A. Street and Charles R. Park

4:00—Organic Age Resisters in Rubber Compounds
Richard A. Crawford, Goodrich Tire & Rubber Co.

TUESDAY MORNING AND AFTERNOON—September 12

9:00—Shearing Plastometer for Unvulcanized Rubber
Melvin Mooney, U. S. Rubber Co., Passaic, N. J.

A plastometer for unvulcanized rubber is described in which the sample is sheared between the surfaces of a rotating disk and a stationary chamber surrounding the disk. In order to prevent slippage the rubber is kept under a confining pressure and the surfaces which shear it are roughened. The stator chamber is made in two sections which close together under the action of a powerful lever system, and in doing so they automatically cut and form the sample of rubber. A complete plasticity measurement including heating the sample can be made in three minutes. The measurement obtained, called the shearing viscosity, is proportional to the mean absolute viscosity of the sample.

9:25—Thermal Properties of Rubber Compounds. I. Thermal Conductivity of Rubber and Rubber Compounding Materials
C. E. Barnett, New Jersey Zinc Co.

The present paper is the first of a series which proposes to discuss the behavior of rubber compounds with respect to thermal conductivity, thermal resistance, and heat generation.

A flat plate calorimeter using electric current as the source of heat and the guard ring principle was designed for measurement of the thermal conductance of rubber compounds.

With few exceptions the results check those obtained by Williams using steam as the source of heat and the heat conductivity of a rubber compound was found to be a straight-line function of the volume per cent of pigment and of rubber. This work was extended to cover the effect of the variables possible in zinc oxide and other generally used rubber pigments on thermal conductivity.

10:00—Service Tests on Tires and Tubes in Which the Rubber Was Exclusively Guayule
J. M. Doering, Firestone Tire & Rubber Co.

Tires and tubes were made in which the rubber used was exclusively guayule. These were of the 4.50/21 size and were tested in Florida over a period of two years. These tires failed at mileages between 8,500 and 10,500 because of tread wear. The inner tubes gave satisfactory service throughout the duration of the test. The problems connected with the development and processing of the compounds are discussed, and the formulas are given.

10:20—Effect of Temperature on the Tensile Properties of Vulcanized Rubber
A. A. Somerville and W. F. Russell, R. T. Vanderbilt Co.

This paper covers technical and commercial aspects of the effect of temperature on the tensile properties of vulcanized rubber. The tensile properties and tear resistance of a large number of commercial inner tubes, before and after aging by different methods, are studied at 0°, 25°, and 100° C.; and wide variations in the behavior of the tubes at these temperatures are shown. A number of uncured bus-truck tube stocks are also studied from the point of view of their capacity to withstand high temperatures.

The effect of testing rubber at 100° C. as compared with room temperature is discussed; and it is shown how some compounds collapse at 100° C., while others have tensile properties equal to, or better than, those at 25°. The effect of testing artificially aged specimens at 100° C., as well as at 25°C., is discussed; and it is shown that the high temperature test may reveal conditions of deterioration and overcure that are not noticeable in the 25° tests. The compounding and curing conditions that lead to high tensile properties at 100° C., as well as those which cause inferior quality, are discussed. The literature on the subject of physical testing at different temperatures is also reviewed.

11:05—Temperature Coefficient of Vulcanization
R. E. Morris, Goodyear Tire & Rubber Co.

Temperature coefficients are determined for stocks accelerated with (a) mercaptobenzothiazole, (b) mercaptobenzothiazole with diphenyl guanidine, (c) mercaptobenzothiazole with diphenyl guanidine neutral succinate, (d) dibenzothiazyl disulfide, (e) dibenzo-

thiazyl disulfide with zinc dimethyl dithio carbamate. Cures are made at intervals from 223° to 306° F., and also in a constant-temperature oven in a bolted mold at 194° and 172° F. The values obtained from modulus and combined sulfur data are found to be (a) 1.41 and 1.54, (b) 1.41 and 1.54, (c) 1.43 and 1.43, (d) 1.50 and 1.52, (e) 1.48 and 1.51, respectively (for 10° F. intervals).

11:25—Comparison of Oxygen-Bomb, Geer Oven and Air-Bomb Aging Tests

E. W. Booth and R. L. Shipley, Rubber Service Laboratories Co.

Because of the length of time necessary to carry out the Geer oven aging tests, the possibility of using the air-bomb aging test instead was investigated. A large number of comparisons in gum stocks were made between experimental and commercial materials in oxygen-bomb, Geer oven, and air-bomb aging tests. Without exception the results of our tests showed that the Geer oven and air-bomb age tests gave similar results, and that antioxidants which gave satisfactory results in the air-bomb aging tests likewise gave satisfactory results in Geer-oven aging test. Further experimenting must be done to include tread stocks in the air-bomb aging tests.

2:00—Natural and Synthetic Rubber. XII. Reversible Vulcanization by Organo-Metallic Derivatives

T. Midgley, Jr., A. L. Henne and A. F. Shepard, Ohio State University

Slightly degraded sol rubber is vulcanized by means of the Grignard reagent to a material similar in properties to soft cured rubber (undercured) and having a tensile strength above 900 lbs. per sq. in. The vulcanizate is reverted by water or dilute acids to a material having the same physical properties as the original rubber, and the vulcanization and reversion may be repeated with this material. Reversible vulcanizations are also obtained with zinc alkyls and EtZnI. A sol rubber, after special treatment to eliminate oxidation products, is not vulcanizable by organo-metallic compounds. The vulcanization is attributed to the formation of metal complexes with oxidized rubber molecules, and the devulcanization to the destruction of these complexes. The theory that the formation of polar groups on the rubber molecule is essential to produce vulcanization is thus given considerable support.

2:30—Further Studies on the Iodine Value of Rubber and Gutta Hydrocarbon as Determined by Iodine Chloride

A. R. Kemp and G. S. Mueller, Bell Telephone Laboratories

The reactivity of various halogens towards rubber and gutta hydrocarbons has been studied quantitatively. The behavior of both hydrocarbons towards halogens is very similar. The order of reactivity of the halogens is as follows: chlorine, bromine, iodine chloride, iodine bromide, and iodine. The results show that gutta possesses a greater initial reactivity towards iodine than does rubber.

Data and detailed procedure are presented which offer further refinements to the iodine chloride method for the determination of the unsaturation of rubber and gutta hydrocarbons. Methods for the preparation of pure rubber and gutta hydrocarbons are included and the corresponding iodine values found by the use of the modified chloride procedure are shown to be in close agreement with the theoretical.

It is recommended, in the case of gutta hydrocarbon, that a greater excess of ICl be used and that the reaction be carried on at room temperature for a longer period of time than that required for rubber.

3:00—Fluorescence of Rubber and of Compounding Ingredients

V. N. Morris, Firestone Tire & Rubber Co.

The color of the fluorescent light (if any) emitted by various rubber compounding ingredients when exposed to ultra-violet light has been observed. Many antioxidants, softeners, and accelerators exhibit fluorescence, whereas, of the inorganic pigments examined, only zinc oxide showed a characteristic effect. The fluorescent colors of various commercial brands of zinc oxide permit them to be distinguished from one another. Particle size was found to govern the fluorescent colors of a series of zinc oxides all made from the same original material. After low-temperature ashing of rubber stocks (containing various zinc oxides), it is possible to identify the zinc oxide used, provided it has a sufficiently characteristic fluorescent color. Well-vulcanized rubber shows a yellow fluorescent color of fairly strong intensity, while decidedly undercured rubber fluoresces but slightly. In general, no definite relation between optimum physical properties and the intensity of fluorescence was apparent. Rubber loses its capacity for fluorescing almost completely upon being exposed to direct sunlight for one hour. The results of a brief spectroscopic study of the fluorescence of a number of compounding ingredients and of certain other substances are presented.

3:25—An Automatic Modified Falling-Sphere Viscometer

B. A. Jones, Firestone Tire & Rubber Co.

An automatic, modified falling-sphere type of viscometer for very viscous liquids has been developed. It has been put into practical use as a factory control instrument. The instrument is shown to give reproducible results for rubber cements and for petroleum products. In addition, it is demonstrated that viscosities obtained on this instrument are nearly proportional to absolute viscosities over a very wide range.

3:50—Testing of Reclaimed Rubber

Henry F. Palmer, Xylos Rubber Co.

A description and interpretation of physical tests on raw reclaimed rubber are presented. A discussion of the merits of tests on reclaim-sulfur cured compounds versus tests of typical compounds containing the reclaims shows that the former are of little value, except in the case of specific gravity. A testing procedure is recommended for the consumer of reclaimed rubber, which stresses processing and physical tests on cured compounds from a factory test run (preceded by laboratory tests only if they can be interpreted accurately) using a specific and suitable recipe.

4:15—Rubber Plasticity Control

J. H. Dillon, Firestone Tire & Rubber Co.

Experiments to determine the practical value of the "recovery" measurement of the Williams plastometer in rubber plasticity control testing are described. An empirical relation between y-value and time of milling was found for gum rubber on a cold laboratory mill. This relation furnishes a convenient method of analysis of the Williams plastometer indices. The relation between these indices was investigated with respect to amount and method of breakdown of the rubber and to the degree of "set up" of typical factory stocks. No marked advantage of the "recovery" measurement over the usual "y-value" measurement, from a practical standpoint, was discovered for the samples of crude rubber and rubber stocks tested. Some results obtained with an extrusion plastometer operating at high rates of shear are given which indicate that the extrusion type of plastometer offers a better criterion of plasticity of rubber than does the compression instrument.

6:30—Rubber Division Banquet, Hotel Sherman

THURSDAY MORNING—September 14

9:00—Mechanism of the Vulcanization of Rubber with Sulfur

W. K. Lewis, Lombard Squires and Robert Nussbaum, Jr., Massachusetts Institute of Technology

The assumption that the chemical addition of sulfur to rubber involves the formation of an intermediate accelerator-sulfur complex is shown to correlate quantitatively the data on the kinetics of vulcanization. Sulfur addition, accordingly, consists of two consecutive reactions—

$$A + S = AS \text{ and } AS + R = RS + A$$

and the rate of vulcanization, as measured by the formation of combined sulfur, is determined by the rate of the slower reaction. The conditions under which either reaction is controlling and the corresponding, integrated reaction rate equation have been worked out. The effect of the exothermic character of sulfur addition on the kinetics of high sulfur cures is discussed.

9:50—Effect of Cure on the Physical Properties of a High Sulfur-Rubber Mix

Robert Nussbaum, Jr., Lombard Squires and C. C. Smith, Massachusetts Institute of Technology

The tensile strength, elongation, density, and combined sulfur of a 50 sulfur—100 rubber mix have been determined over the complete range of cure at 142° C. The variation in the stress-strain relation-

ships as a function of the state of cure has been presented. The marked pitting and surface imperfections which are sometimes observed during hard rubber cures are ascribed to the abrupt increase in density of the mix when the intermediate rubber stage is reached.

10:15—Effect of Oxygen on the Plasticization of Rubber

W. K. Lewis, Lombard Squires and A. J. Sysko, Massachusetts Institute of Technology

The mastication of rubber on a laboratory mill in various concentrations of oxygen has been studied. At low oxygen concentration, the plasticization is slow and limited in extent. Higher concentrations of oxygen than found in air produce but little additional effect. The effect of temperature has been investigated.

Preliminary data are presented on the cure of a rubber-sulfur mix compounded in an inert atmosphere. This showed a faster rate of cure than a similar mix compounded in air, but no increase in maximum tensile strength.

10:40—Thinning and Gelation of Rubber Cements

C. K. Novotny, Firestone Tire & Rubber Co.

The use of red filters very markedly retards the degradation of rubber in solution caused by light. Brown filters are also effective in reducing the action of light on cements. Cements of a definite viscosity with an increased gum content are more stable toward the degrading effects of light and heat than are those with a lower content.

Di-beta-naphthyl-para-phenylenediamine was the only antioxidant of the list tested which would retard thinning caused by elevated temperatures. However, light must be excluded from cements containing this antioxidant or a rapid thinning will take place.

11:00—Plioform—A New Thermoplastic Molding Material

H. R. Thies and A. M. Clifford, Goodyear Tire & Rubber Co.

(No abstract available)

11:30—Development of Structures in Uncured Rubber on Standing

W. F. Busse and J. M. Davies, B. F. Goodrich Co.

Information was obtained about the structures formed in rubber and rubber-pigment systems by studying the plasticity changes which occurred when these systems were aged at various temperatures from 5° to 150° C. for periods up to two years in the case of samples aged at the lower temperatures.

Milled crude rubbers may show three changes during storage at 70° C. or above: first, an initial softening, possibly due to the effects of peroxides formed in the rubber during the milling; then a slow hardening; and finally, if aged long enough, another softening due to thermal oxidation. The initial softening does not occur with hot-milled pale crepe or with sprayed latex, which do not evolve detectable amounts of peroxides after milling.

Pigments such as clay, zinc oxide, lampblack, thermatomic carbon, and magnesium carbonate may greatly affect the initial plasticity of the rubber, but they have only a small effect on the change of plasticity with time of aging.

Gas black causes a large and rapid decrease in plasticity on standing. In stocks containing 30 per cent gas black, the rate of change of plasticity increases with temperature up to 150° C. The addition of 10 per cent stearic acid to a compound of 100 parts of pale crepe and 54 parts of gas black made the stock softer initially than that without the stearic acid, but it also increased the rate of change of plasticity with time, so that after standing a week at 98° C. the two stocks had about the same plasticity.

The addition of small quantities of m-phenylene diamine to rubber also increases the rate of stiffening on standing, but the structure formed in this case is quite different from that formed in gas black stocks.

Solubility tests confirm the existence of structures in many aged pigmented stocks, and they show that these structures develop more rapidly at high temperatures. When rubber-gas black stocks, aged for several days, are put in benzol the samples retain their shape for several years.

12:00—Business Meeting

Review of Goodrich Chemical Research

IN "Typical Records of Research in Chemical Engineering Industries" contained in "The Silver Anniversary of Chemical Engineering in America" souvenir volume of the 25th annual meeting of the American Institute of Chemical Engineers, the work of The B. F. Goodrich Company, Akron, Ohio, in research is described by Dr. H. L. Trumbull, maanager of chemical research laboratories. The review, in part, follows:

"Scientific control and development of raw materials, extensive laboratory and service testing of finished goods, and continual study and improvement of processes have accompanied the rapid growth of the Goodrich Company. Of the many advances made during this period only a few typical examples are mentioned here:

"Organic Accelerators, first discovered (1906), effected a marked improvement in the quality and the service life of rubber goods, at an appreciable reduction in the cost. About eight million pounds are used annually by the rubber industry.

"Accelerated aging studies (1921) gave a rapid method of aging which led to the discovery of antioxidants (1924) chemicals which effectively increase the service life of rubber products. The annual consumption approximates four million pounds.

"The discovery of thermoprene (1926) made possible the "Vulcalock" process (1927) a method of bonding rubber to metals during vulcanization. This process permits the lining or covering of equipment on various forms and shapes to combat corrosive and abrasive wear, thereby meeting many demands of the heavy chemical industry served by no other material. Thermoprene forms the base of lacquers capable of giving adherent, tough films which effectively resist alkalies. It is also a superior cable insulation material, low in water absorption.

"In the manufacture of rubber goods directly from natural and artificial aqueous dispersions marked improvements have been effected in the preparation (1924) and compounding of such dispersions (1931) and in the steps necessary to produce from such dispersions rubber goods with superlative physical properties (Anode Process)."

Reviews of many other leading industries are contained in the typical records of research in chemical engineering industries contained in the volume, among which are: Aluminum Company of America, The Bakelite Corporation, Dow Chemical Company, E. I. Dupont de Nemours & Company, Inc., Eastman Kodak Company, General Electric Company, Hercules Powder Company, Monsanto Chemical Works, National Lead Company, New Jersey Zinc Company.

Specific Gravity Determination

IT IS assumed that the specific gravity of each of the materials in a compound is known. The weight of the material in a compound divided by its specific gravity equals its relative volume. The total weight of the materials in a compound then, divided by the total of the relative volumes of the materials contained in it, equals the specific gravity of the compound. Example:

Material	*Weight*	*Spec. Gravity*	*Relative Volume*
Rubber	50 units	0.93	53.80
Sulphur	50	2.00	25.
Total	100		78.80

Total weight, 100 divided by total relative volume, 78.80 equals 1.27 Specific Gravity of compound. (R. R. Olin Laboratories, Akron, Ohio.)

The Trend in RUBBER EQUIPMENT Development

—By I. TORRENCE GURMAN*

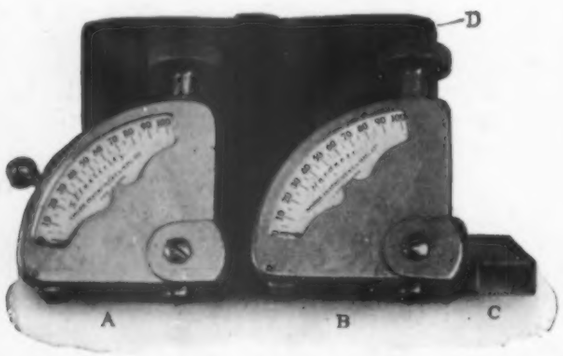
[Continued from August Issue]

FOR such control physical testing as abrasion, tensile, hardness, density, elongation, and plasticity, standard equipment prevails, but even in these have changes been made to take care of new developments, and to increase accuracy and sensitivity; for example, the testing of square cut threads of small dimensions such as No. 100 (0.010 inches square) and latex products such as lastex and dipped rubber goods, has brought about modification in equipment used for testing strength and elongation to permit the proper gripping of the test samples to prevent slipping and chafing. A very interesting and promising introduction is a new testing device developed by the Tinius Olsen Testing Machine Company which is under consideration by the A. S. T. M. as a tentative means of testing for compression set of rubber used for vibration absorption. The usefulness of this device becomes evident when one considers the wide range of products to which this test can be applied.

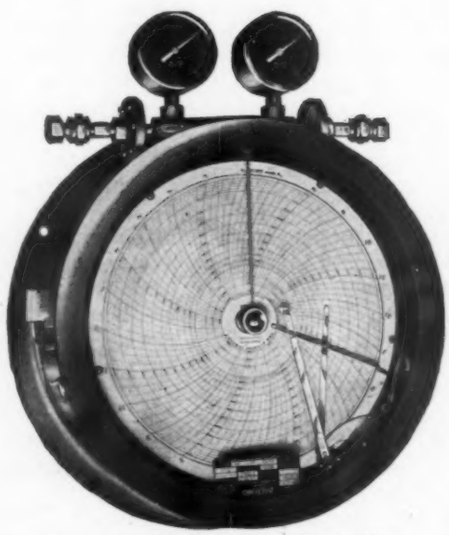
Now indicating and recording instruments are undeniably of great value, but their value is not intrinsic, and depends on not so much the attainment of the indication or the production of a record as upon the use to which such indication or record is put. It is natural therefore that the next stage of the development of this type of equipment should take the form of automatic self-adjustment such as is obtained with so-called "control" instruments. These readjust conditions to bring them in conformation with prescribed requirements. Thus a control thermometer will automatically adjust the flow or application of the heating medium, such, for example, as the amount of steam flowing into platens, vulcanizers, or heating coils; the ratio of steam to water (or hot water to cold water) or the amount or rate of combustion of a liquid or gaseous fuel.

Schopper Thread and Insulation Tester (Testing Machine Co.)

Compression Set Tester (Tinius Olsen)



Shore Durometer (Eimer & Amend)



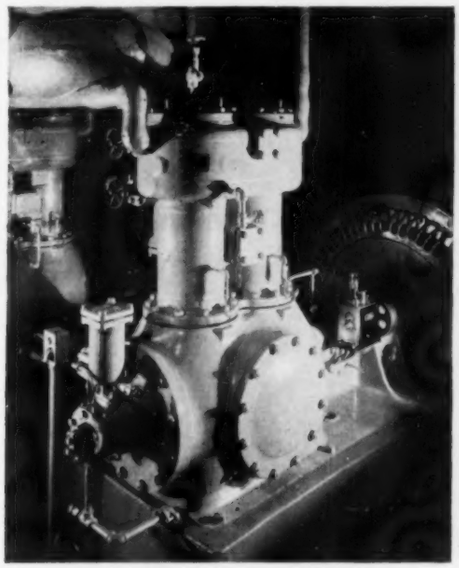
Temperature Recorder-Controller (Foxboro)

Where single or simple operations are concerned, such control instruments are sufficient to accomplish the desired results. However many operations include several separate and distinct functions. In such cases several instruments are used; and means for controlling the complete cycle have been introduced with remarkable success both from a production and a quality standpoint. In particular have such installations been adopted in conjunction with the operation of presses and vulcanizers and have proven very effective in eliminating much of the personal element so long associated with the operation of this type of equipment.

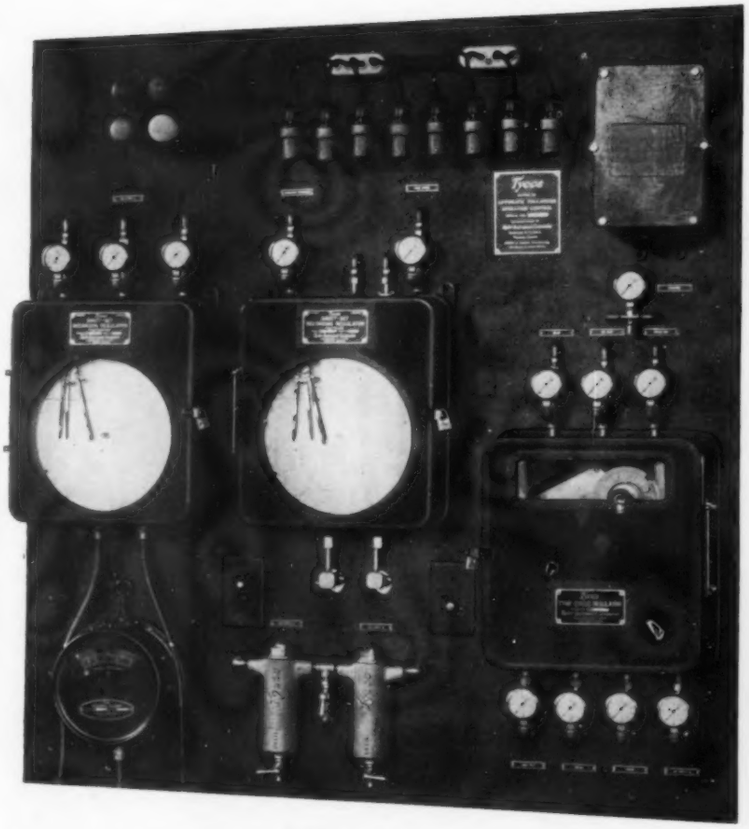
In the operation of a rubber plant, water is a very im-

Rubber Tester (Scott)

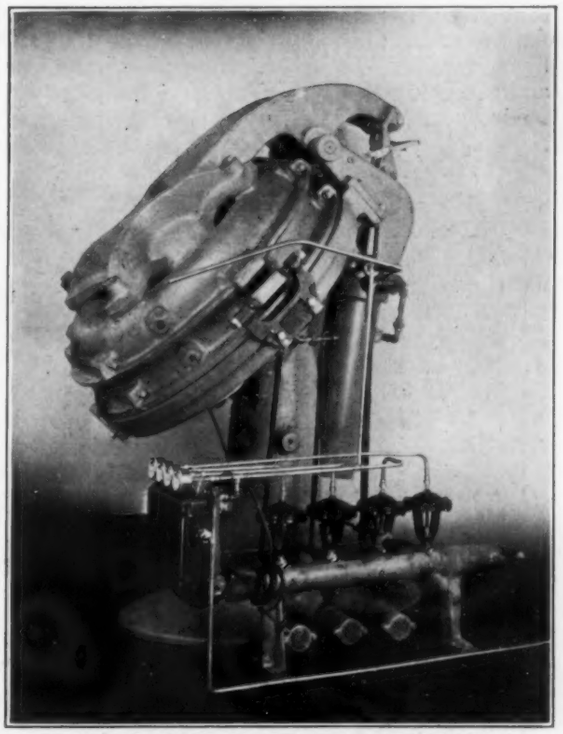
Electrical Thermometer Controller (Bristol Co.)



Ammonia Refrigeration Compressor (York Ice Machinery Corp.)



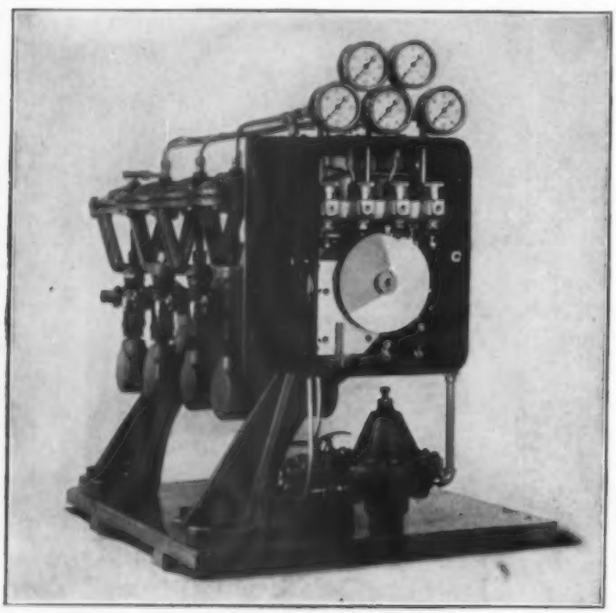
Panel Board of Taylor Automatic Vulcanizer Operation Control



Individual Tube Vulcanizer Equipped With Taylor Time Cycle Regulator (National Rubber Machinery Co.)

portant item. As such, it is used for controlling the temperature of mills, calenders, mixers, dryers, etc. It is also used alternately with steam in hot and cold press processes. As steam it is almost universally used as the heating medium for all types of rubber manufacturing equipment (the only noteworthy exceptions being the recently introduced electrically heated presses and tubing machines) and as a power medium for some types of pumping and turbine equipment. In both forms in which it is utilized it presents the problem of conservation as well as optimum application. Where it is used for circulating purposes some of the controlling factors are fixed by the construction of the equipment involved or by the nature of the operation performed. Among these factors are radiation surface, thickness of shell, size of apertures, conductivity, temperature and heat capacity of the stock, and heat introduced or developed during the operation. Since the efficacy of the heat absorption depends on the rate of flow and the (square root of the) difference of temperature between the stock—or equipment—and the water, it has been found advantageous as well as economical to use refrigerated water instead of city or river supply especially where the supply is limited in quantity or where its cost is high. For this purpose the ammonia refrigerating unit has proven very adaptable. In the case of steam the recovery (as condensate) has always been recognized as good engineering practice because of the problems involved in the use of hard waters, and because of the conservation of heat remaining in the condensate. Proper condensing, trapping, and return systems are important and the thorough insulation of both steam and condensate piping, as also in the case of the circulating water above, is very important. In this regard a most useful adjunct is the recent industrial application of the reflection principle of insulation. In the case of piping this takes the form of foil wrapping using such foil as aluminum, and in the case of equipment, in the plating of retaining walls with chromium, etc.

It is interesting in viewing in prospective the many useful and practical improvements that have been made in recent years in the rubber industry, to observe that these improvements can be readily introduced into and adopted by both the large and small rubber plants with equal facility and almost equal utility. This has been largely due to the tendency to build equipment more compact and yet more simplified, and to redesign many machines to widen their compass and scope of application. It is for these reasons that so many of these developments have deservedly received and will continue to receive such widespread acceptance and adoption by the rubber industry.



Process Cycle Controller (Bristol Co.)

Calcene—New Reinforcing Pigment

The Columbia Alkali Corporation, Barberton, Ohio, has recently put on the market a new reinforcing calcium carbonate pigment for rubber. It is a precipitated product of extremely fine particle size, running over 98% under 0.4 microns. The surface of the particles is coated with approximately 2% of a rubber soluble organic material. This coating agent prevents cementation of the individual particles and gives complete dispersion of the pigment.

It is claimed that Calcene gives tensile, tear and abrasion resistance values considerably higher than other reinforcing rubber pigments, except the gas blacks. At approximate loadings, tensile and tear resistance values, hitherto obtainable only with soft gas black, can be reached with Calcene.

The use of Calcene is indicated, by its makers, in rubber stocks requiring high tensile and high resistance to tear and abrasion, especially where a black stock is not desired, or where a relatively soft modulus is desired along with the high physical properties.

I. R. I. Examination in Rubber Technology

OF POSSIBLE interest to our readers is the following examination paper in General Rubber Technology given recently by the Institution of the Rubber Industry in London to candidates for degrees.

Five questions to be answered—Time allowed, 2½ hours

Ques. 1. Give reasons for selecting three different accelerators to obtain three different types of products, and state in each case the type of accelerator suitable for each particular product.

Ques. 2. Give a brief outline of methods that have been employed to recover naphtha and other solvents during the spreading and impregnating of fabrics with rubber. State why in your opinion the early attempts were mainly unsuccessful.

Ques. 3. Describe a tubing-machine suitable for producing hollow, solid or covered products and mention the type of faults commonly occurring with tubed products.

Ques. 4. Sketch a heel pad or door stop and a nest mould to produce six rubbers, and describe briefly the processing of the rubber from the mixing-mill to the finished article.

Ques. 5. Discuss the manufacturing processes used in preparing from latex directly (1) sponge upholstery, (2) toy balloons, (3) cycle inner tubes.

Ques. 6. Give a list of rubber goods that come in contact with foodstuffs and beverages, and describe the difficulties that arise in the interactions between rubber goods and such materials.

Ques. 7. Describe the laboratory organization in a rubber works for controlling raw materials, processes, and finished products.

Ques. 8. What are the chief regulations in the United Kingdom affecting rubber factory operations?

HALOWAX is a synthetic wax-like substance possessing several unusual characteristics not found in the commonly known mineral, vegetable, animal or synthetic waxes. It is suggested as a plasticizer for gums, resins and other waxes on account of its high melting point, toughness, low volatility and solvent action. (The Bakelite Corp., N. Y.)

Descriptions of New and Improved Rubber Machinery and Equipment

Speedway Automatic Oilers

A NEW line of automatic oilers has just been anounced by the Speedway Manufacturing Company, Cicero, Illinois. These oilers are of the Constant Level and Thermal types. The constant level oilers are designed especially for use on electric motor bearings and other reservoir bearings with oil-ring, packing, or ball or roller bearings where oil in the reservoir should be maintained at a determined level. This is done by means of a tube which permits air to enter and oil to flow from the reservoir when the level of oil in bearing reservoir drops below the fixed and proper level—automatically stopping the flow of oil when this level is attained. The thermal oilers, designed for use on sleeve bearings of the open type, are

Speedway Oiler Mounted on Motor

operated wholly by a change in the bearing temperature. Heat in the bearing causes an expansion of the air in the thermal chamber, forcing small quantities of oil to the bearing. Both types have a visible oil supply.

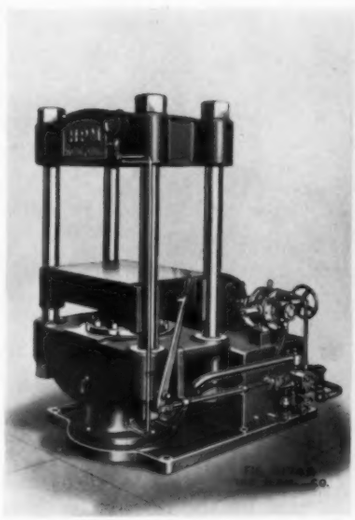
Self-Contained Hydraulic Presses

A NEW, modern edition of a familiar form of hydraulic platen press is now introduced by The Hydraulic Press Mfg. Co. of Mount Gilead, Ohio. This press consists of the regulation upward-acting type of press frame with its own individual hydraulic power plant—thus forming a compactly self-contained motorized machine.

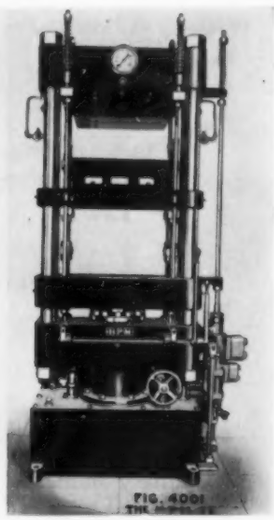
The hydraulic operating pressure is generated by a "Hydro-Power" Unit, consisting of the H-P-M variable delivery radial pump with direct connected electric motor, mounted together on a base enclosed for containing the oil used as pressure fluid and lubricant. This unit can be mounted in any convenient location adjacent to the press at the side or rear.

The pressure exerted by the press and its speed of ram travel are subject to close automatic regulation, through controls governing the output of the power unit.

Among the advantages attending the installation of this self-contained press over conventional hydraulic presses operated from a central accumulator system are: savings in installation cost, savings in floor space, no restrictions on



Basic Model of H. P. M. Self-Contained Presses



Press Equipped for Plastic Molding

location, no need of attempting to provide for hypothetical future hydraulic power requirements.

Operating features of the press include: automatic pressure regulation with adjustable pressure capacity, variable working speed, low operating costs with power consumption proportional to the effective work performed by the press.

Figure 4174-A shows the basic model of this line of presses, mounted on a bed plate with the "Hydro-Power" unit at the rear. This type of press is employed for many different kinds of forming operations and may be equipped with various types of pressing fixtures extending its utility.

Figure 4001 illustrates one arrangement of the basic press, with an intermediate pressing platen, thus providing two presses in one. This press is especially fitted for plastic molding service, being equipped with die bolsters and ejectors for "semi-automatic" or fixed multiple cavity molds.

The presses are available in standard pressure capacities of 25, 50, 75, 100, 150, 200, 250, 300, 400 and 500 tons, each with square or open side platens varying in increments of 12 inches.

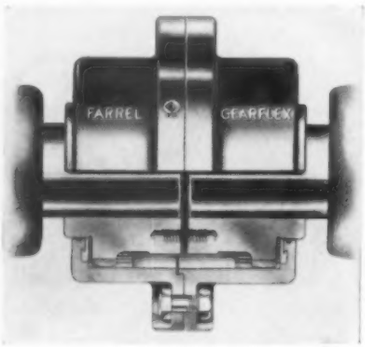
Farrel "Gearflex" Couplings

A NEW flexible coupling of the gear type, known as the Farrel "Gearflex" Coupling, has recently been introduced by the Farrel-Birmingham Company, Inc., Buffalo, N. Y.

The double engagement type illustrated consists essentially of two externally geared hubs keyed to the two shafts to be connected and engaging an internally geared floating sleeve which encases the two hubs. With two sets of spur gears, one at each end of the floating sleeve, misalignment is compensated for by the sleeve assuming a neutral posi-

tion between the two shafts. Thus, all whip or crank action is eliminated, relieving bearings and shafts of heavy pressures or vibration. The use of accurately generated external and internal spur gears, cut on the Sykes gear generating machine, insures precision and distribution of the load over a large number of contact surfaces.

The large reservoir between the hubs and the floating sleeve carries the supply of lubricant. When the coupling rotates, centrifugal force throws the oil to the inner surface of the floating sleeve where it spreads between the gear



Farrel Gearflex Coupling

teeth, entirely immersing the load-carrying surfaces in a bath of oil. The load is carried by the oil film with no metal-to-metal contact between the teeth, thus providing a cushioning effect which gives a high degree of quietness in operation and reduces wear to a minimum.

The Gearflex coupling is also made in a single engagement type which has only one externally geared hub in engagement with an internal gear in the sleeve, the other hub being solid and the sleeve bolted to it. The single engagement type is designed to provide a lower cost coupling for applications where the high speed capacity and the high degree of flexibility of the double engagement type is not required.

Mercury Tube Relay Switch

THIS new mercury tube relay, brought out by the Hart Mfg. Co. of Hartford, Conn., is a no-arc, type switch, positive and quiet in action, and designed for controlling

Hart Tube Relay Switch

non-inductive loads, up to 25 amperes at 250 volts by means of a low amperage secondary circuit. Some of its uses are for light and heat control, control of signal systems, special machines, starting and stopping motors and temperature control. It is also said to be essential where inflammable gases and dust are present.

Attention, **MACHINERY MANUFACTURERS:**

If you have brought out any new or improved machinery, send us a description for publication.—EDITOR.

Development and Manufacture of HIGH PRECISION GEARS

[Continued from Page 252]

gears may dip in a bath of oil, but only sufficient to allow the gear teeth to dip a little more than their depth. An excess quantity of lubricant creates a churning effect which generates heat and reduces the viscosity of the lubricant.

Higher speed gears require a lubricant of less viscosity and as before stated they should not run in an oil bath when the tooth velocity is over 2,700 feet per minute. The lubricating oil for such gears has a viscosity of 300 to 400 Saybolt at a temperature of 100 degrees Fahrenheit.

Very low speed gears may be lubricated by a heavy compound or a lubricant with an asphalt base.

Methods of Cutting Teeth

All precision gears, in fact, nearly all gears made at the present day are cut by what is known as a generating process. By this process the teeth are what may be termed "progressively" cut. The older method was to use a tool of the shape of the tooth space; the newer method uses a tool which itself represents a gear and the principle of action of the machine is the same as two gears gearing together. The cutting tool is in the form of a master gear or pinion.

The same machines are also used for cutting internal gears. The use of internal gears, especially those of large size, has been retarded due to the fact that they could not be cut with facility. Today's machines, however, cut them just as easily as gears with external teeth and as a result internal gears are finding a greater application.

The cutting of single helical gears is easily accomplished on the same class of machine.

Cutting Sharp Apex Herringbone Gears

Engineers are curious to know how it is possible to cut herringbone teeth having sharp apices. It seems to the uninitiated that the absence of tool clearance is an insuperable difficulty. The following explanation is, therefore, offered.

The cutters are mounted in the gear cutting machine with their cutting faces facing each other. Both cutters are mounted on one reciprocating carriage, so that, as they reciprocate to and fro, one cutter cuts when the movement is in one direction, and the other cuts when the movement is in the opposite direction. The construction of the machine insures that each cutter will end its stroke when its cutting edges are at the center of the blank face. It may thus be assumed that when one cutter reaches the end of its cutting stroke it leaves a burr or chip, and that the other cutter, when completing its working stroke, removes this burr and leaves another.

That is what actually happens, but there is another interesting and very important feature which makes this method successful. The cutters not only reciprocate and twist during their reciprocation, so as to generate the helices, but they also slowly revolve in unison with the wheel blank, thus generating the tooth contours. This generating feature results in finishing the apices of the teeth in a perfect manner. It can easily be understood that if one cutter merely removes the burr left by the other cutter, and in its turn leaves a burr, there will be some burr left finally. The generating action, however, of these cutters makes it impossible to leave any surplus metal, provided the machine is properly adjusted, because as each cutting tooth slowly revolves out of engagement with the tooth space it has cut, it cuts a chip which tapers off to an infinitesimal thickness, and this has the effect of cleaning out the corners perfectly.

Editorial Comment

Rubber Restriction

FOR many months rubber restriction, either of production or exports, has been discussed pro and con in the foreign press and there have been numerous reports of agreement between the British and Dutch only to be denied within a short while. This situation, coupled with the general weakness of other commodities and foreign exchange fluctuations, has resulted in a general unsettlement of the rubber market which has done good to neither the producer nor consumer. It begins to become more and more apparent that the chances of restriction of any sort are diminishing daily and soon will be at the vanishing point. The situation today differs greatly from the time when the British attempted the Stevenson scheme a few years back without Dutch co-operation. The lack of Dutch agreement at that time was attributed to inability of controlling native production. The Dutch have continued to foster such production with the result that it would be more difficult than ever to control —making it manifestly impossible for the Dutch to enter any restriction scheme. Added to this situation is the growing importance of rubber production from French Indo-China, a producing country which has refused to join any restriction scheme.

The Dutch do not appear to be able to co-operate, French Indo-China will not, and even in some quarters of England it has become apparent that present attempts are futile. For the good of the whole industry therefore, it is to be hoped that a realization of the hopelessness of the task will dawn on those who are working on the several restriction schemes and the matter dropped.

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Speeding Recovery

COMMENTING on the current increase in retail sales as compared to last year the National Association of Credit Men points out that business must not expect an increase in earnings immediately for expenses of conducting business are almost certain to increase more rapidly than do sales during the early months of the Recovery Program.

"This naturally brings to the fore the importance of credit," continues the statement, "for the businesses, most of which have not been on a paying basis during the past few years, will for the present be asked to assume a further burden of increased operating costs without an immediate return commensurate with the increased cost. Some businesses are financially able to assume that extra burden. Some, it is hoped, will be able to do so through greater efficiency and lower overhead. Many others will not be able to do so unassisted."

Stressing the need of a general measure of co-operation as being vitally necessary to the success of the National Recovery Act, H. H. Heimann, Executive Manager of the Association, presents a three-point program to insure the legislation accomplishing its short range objectives.

First, a frank appeal to well-financed industries to absorb temporarily the additional costs involved in meeting larger pay-rolls, without attempting to pass the cost on to the consumer; this of course being a sacrifice but much preferable to a dole or capital levy and possible of absorption through increased purchasing power adding volume. Second, not to increase prices beyond the cost of increased labor. Third, the need for normal spending by the consuming public.

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The Purpose of NRA

GENERAL COUNSEL, Donald R. Richberg, of the NRA, has the happy faculty of being able to drive home the salient points of the current recovery drive in many of the addresses he is called on to make. Concerning criticism of some portions of the Act and our mutual obligations he stated in a recent address:

"This law is frankly an experiment. Its trial by the American people is a great adventure. The economic theories underlying it may be wrong. But that will be hard to prove. The mechanisms provided for in the law, and set up by the Recovery Administration, may prove to be inadequate or impractical. The sponsors and administrators of the law claim neither genius, nor divine inspiration. They would welcome the assistance of an authentic variety of either. But men and women who are working at incredible and exhausting speed in Washington, under the general supervision of the President and under the immediate direction of General Johnson, together with the able representatives of all groups of interest in trades and industries who come to Washington to support or to modify Codes—practically all these people are attempting in a truly cooperative spirit to prove that the American people are capable of an achievement without precedent; the reorganization of a political economic system without a revolution of violence. We believe that the task can be accomplished because there is no change attempted in the final objectives of the American people. We are changing only our methods of attaining the goal toward which we fought in the Revolutionary War, and toward which we have been fighting, or thought we were fighting, in every major struggle of our history—the goal of the greatest possible freedom and security for every American citizen."

CURRENT • NEWS of the Rubber Industry

SEPTEMBER, 1933

Committees Still Working on Tire Code; "Tire Code Authority" to Administer Terms

Original Tire Code Submitted in July is Being Revised —Fair Practice Committee is Replaced by Tire Code Authority—Other Codes Being Completed

THE tire industry code, originally submitted on July 29, and since then being revised in some particulars and to which a supplementary code of fair practice is to be added, is still being discussed and at this writing no date has been set for its resubmission to NRA officials. Reports have emanated from various sources of the intense fight being waged in committee meetings on the open shop and production allocation clauses. Undoubtedly these matters are being considered but no official announcement has been forthcoming. About the most definite information made available, and not denied, is the substitution of the original so-called "Fair Practices" Committee, by a new "Tire Code Authority," a committee of eight with alternates, whose duties will be to administer the provisions of the revised code when completed.

This new committee of eight is said to include the following: P. W. Litchfield, President of the Goodyear Tire & Rubber Co.; H. S. Firestone, Sr., Chairman of the Board of Firestone Tire & Rubber Co.; James D. Tew, President of B. F. Goodrich Co.; William O'Neil, President of General Tire & Rubber Co.; W. H. Lalley, President of Kelly Springfield Rubber Co.; Charles Borland, President of Mohawk Rubber Co.; C. C. Gates, President of Gates Rubber Co.; and Irving Eisbruch, President of McClaren Rubber Co.

Alternates Selected

Alternates for members of the new committee are: F. B. Davis, President of the United States Rubber Co.; A. A. Garthwaite of Lee Tire & Rubber Co.; F. A. Seiberling, President of the Seiberling Rubber Co.; J. A. Walsh, President of the Armstrong Rubber Co.; E. D. Levy, President of the Fisk Rubber Co.; J. A. MacMillan of the Dayton Rubber Co.; G. W. Stephens, President of the Mansfield Tire & Rubber Co.; and J. W. Whitehead, President of Norwalk Tire & Rubber Co.

It is understood that this committee is also assisting in the drafting of the revisions being made in the code.

While the tire code is being determined, codes for various other divisions are being prepared. Among those being rushed to completion by committees of the Rubber Manufacturers' Association are Drug Sundries, Sheet Rubber and Sundries, Proofers, Automobile Top Material, Boots and Shoes, Mechanicals, Heels and Soles, Hard Rubber, Flooring and several others.

It is also understood that the Rubber Reclaimers and Balloon and Novelties Manufacturers are submitting separate codes.

Following the completion of the tire code it is said that a general code for the whole rubber industry, exclusive of tires, will be prepared.

Tire Prices Not Increased

The fourth tire price increase since last spring, expected in many quarters late in August, failed to materialize. Though manufacturing costs would warrant another rise in prices, the unsettled condition of the industry due largely to the uncompleted tire code, has not made it possible to put through an increase at this time.

DEALERS SUBMIT CODE ON TIRE RETAILING

A code of fair competition for retail tire dealers was filed in Washington on August 29 by the National Tire Dealers' Association. The code provides a 40-hour week for clerical help executives receiving salaries of $35.00 a week or more in northern states and $30.00 in southern states, except that there may be three 48-hour weeks in any six months' period to make up for holidays and take care of inventories.

For deliverymen and service help a 48-hour week is requested, with time and a third for overtime of more than eight hours a day. The code also provides for the installation and use of an accounting system and for the filing of minimum net prices and list prices with maximum discounts and trade-in allowances, which in no case shall be less than the average cost of doing business as determined by members in the same market area plus a fair and reasonable profit.

The code also attempts to eliminate unfair advertising and the use of false statements guaranteeing the product as to time, mileage or performance. It also is proposed that retreaded tires shall be so marked.

The Greater New York Tire Dealers' Association, Inc., had previously submitted its own code in which a minimum salary of $15.00 was set for any employee and a maximum work week of 48 hours. Other items covered were breaches of contract, misbranding, misrepresentation, resale prices of 35% above company list, discrimination in prices, rebates, credit terms, contracts, bribery, misleading guarantees, allowances, etc.

RUBBER MACHINERY CODE IS CONSIDERED

Manufacturers of rubber machinery and molds in the Akron district have been considering joining the Special Tool, Die & Machine Industries Association for the purposes of adhering to the NRA principles. Negotiations have been held up, it is reported, pending the working out of a national machinery code. The committee which was working in the proposed code includes C. R. Quine of the Akron Equipment Co., chairman; C. A. Safreed, National Rubber Machinery Co.; Harry Alexander, Summit Mold & Machine Co.; Howard Tham, Mechanical Mold & Machine Co., and George Herdman, Falls Engineering Co., Cuyahoga Falls.

WORKERS STRIKE AT OHIO RUBBER PLANT

A number of employees of the Ohio Rubber Co., Willoughby, Ohio, went out on strike on September 2 because, it was reported, the company refused to recognize their union and that the NRA code relative to working hours had been violated. This was denied by F. G. Smith, president, who said the union had been told the company was willing to treat with union members through the union, but that there were a great many employes who were not members of the union with whom the company would treat individually or collectively, as the non-union workers desired.

The plant has been employing over 900 workers in recent weeks and only 275 were said to have reported on September 5.

After conferences with a committee of local business men on September 7, the factory and union officials declared a 48-hour truce and 700 employees returned to work. It is reported that the truce covered recognition of the union officials as representatives of the factory union group.

Rubber Section, National Safety Council To Hold Meeting in Chicago, October 2-6

WHAT has the rubber industry accomplished during the past year in the control of accidents? What are the most important present-day accident hazards? What are individual companies doing to control these hazards; and what can the industry do, cooperatively, during the coming year in national accident prevention? These are questions which executives from the leading rubber companies will discuss at the sessions of the Rubber Section of the National Safety Council, as a part of the 22nd Annual Safety Congress and Exposition to be held at the Stevens Hotel in Chicago from October 2 to 6. The General Chairman of these sessions will be Charles F. Smith, U. S. Reclaiming Company, Inc.; and the Secretary will be R. A. Bullock, Corduroy Rubber Company.

During the past six years the rubber industry has been making consistent progress in the reduction of the frequency of disabling injuries. During this period accident frequency rates have been reduced by almost two-thirds. Progress in the reduction of the severity of accidents in the rubber industry has been more irregular. As compared with an index number of 100 for 1926, there was a sharp reduction to 61.2 for 1927; then a gradual rise during the next two years to 79.6 for 1929; then another reduction for 1930, a slight advance for 1931, and a considerable reduction to the index number 48.0 for 1932.

Full Session October 3

At the first program session of the Rubber Section, on Tuesday morning, October 3, General Chairman Charles F. Smith will speak on "A Review of Year's Activities." Other features of this program will be "Is the Rubber Industry Making Progress?" by R. W. Morse, Director of Workmen's Compensation Department of the Firestone Tire and Rubber Company; "The Effect of Outside Conditions on Accidents," by J. J. Loge, General Tire & Rubber Company; "The Safe Use of Carbon Tetrachloride in the Rubber Industry," by a speaker to be announced; presentation of "Data on the 1933 Safety Contest," by General Chairman Charles F. Smith; and "Presentation of National Safety Council Trophies and Certificates," by an officer of the National Safety Council.

At the Wednesday morning session, there will be an illustrated talk on Safety Kinks in the Rubber Industry," followed by election of officers. Other papers scheduled are, "Time Study and Safety," by C. L. Hungerford, Director of Safety and Hygiene of the Firestone Tire and Rubber Company; "Respirators for Dust and Fumes in the Rubber Industry," by John M. Lewis, Industrial Sales Manager of the Mine Safety Appliances Company; and "Paying Dividends on the Accident Prevention Dollar," by E. W. Beck, U. S. Rubber Company.

Members of the Rubber Section may secure reduced railroad fares by consulting their local ticket agents. Members in the New York district are planning to travel to Chicago in a group. Those interested can get further details from the New York office of the National Safety Council at 9 East 41st Street.

There will be a permanent exhibit, at the Stevens Hotel, of modern equipment for the promotion of safety and health in industry and in public places. This will include mechanical safety devices, protective clothing, modern first-aid kits and hospital accessories, and motor car control equipment.

The Congress sessions have been so planned that delegates also will have opportunity to visit A Century of Progress. In the Social Science Building on the Exposition grounds there is a permanent safety exhibit by the National Safety Council, in cooperation with the City of Evanston.

RUBBER CONSUMPTION LOWER DURING JULY

Consumption of crude rubber by manufacturers in the United States for the month of July amounted to 50,184 long tons, which compares with 51,326 long tons for June this year, and represents a decrease of 2.2% under June but 67.4% over July a year ago, according to statistics released by The Rubber Manufacturers' Association. Consumption for July, 1932, was reported to be 29,976 long tons. Consumption for first seven months, 1933, amounted to 234,908 long tons as compared with 220,900 long tons for same period 1932.

Imports of crude rubber for July were reported to be 44,290 long tons, an increase of 94.9% over June and 42.5% above July, 1932.

The Association estimated total domestic stocks of crude rubber on hand July 31 at 326,609 long tons, which compares with June 30 stocks of 333,954 long tons. July stocks show a decrease of 2.2% as compared with June of this year, and 2.1% below stocks of July 31, 1932.

The participants in the statistical compilation report 57,435 long tons of crude rubber afloat for the United States ports on July 31 compared with 63,608 long tons afloat on June 30 this year, and 37,894 long tons afloat on July 31, 1932.

July reclaimed rubber consumption is estimated to be 10,327 long tons, production 12,049 long tons, stocks on hand July 31, 14,108 long tons.

Pirelli Joins Latex Processes

The Societa Italiana Pirelli, of Milan, announces its participation in International Latex Processes, Ltd., the new enterprise formed at the end of last year for the purpose of consolidating (outside the United States) the whole of the wide range of patents and technical knowledge held by the Anode Rubber Co., Ltd., and the United States Rubber Co., within the field of the direct use of rubber latex for manufacturing purposes.

Sir Eric Geddes, chairman of the Anode Rubber Co., Ltd., and the Dunlop Rubber Co., Ltd., is to be chairman of the new undertaking. The vice-chairmen will be F. B. Davis, Jr., chairman and president of the United States Rubber Co., and Dr. Alberto Pirelli, director of the Pirelli Co.

Mechanical Prices Advanced

An increase in prices for mechanical rubber goods was put into effect by practically all manufacturers during August to offset the increased cost of rubber, the processing tax of 4.2 cents a pound on cotton and the greater cost of manufacturing due to adoption of the blanket code.

Proving That Low Pressure Tires Are Blowout Proof

The illustration shows an interesting demonstration of how low pressure balloon tires are practically proof against blowouts. As can be seen, the side-wall of the General Jumbo tire has had four holes cut into it exposing the inner tube. Each hole is about 1 inch wide and 2 inches long. This tire has been driven for thousands of miles at all speeds and has demonstrated that not only is there not enough air pressure—14 pounds—to cause the tube to blow out but the pressure is not even great enough to cause the tube to bulge through the openings.

NEW PACKING RULES FOR RUBBER IN EFFECT

The new weight and packing conditions imposed on foreign sellers of ribbed smoked sheets by the Rubber Trade Association of New York, Inc., last June become effective on September 30. From that date, all contracts for shipment from the primary markets to the United States are subject to the following regulations:

Weight—The maximum weight of each bale shall be 250 pounds net per five cubic feet.

Packing—Before covering with burlap, each bale of rubber shall be properly strapped by using not less than three iron bands of a minimum width of 5/8 inches and .026 gauge. These bands should preferably be galvanized. Wires must not be used for strapping.

(b) Talcum powder shall be liberally sprinkled on tops, sides and bottoms of the rubber before the burlap is sewed on.

(c) Nothing inferior to new 12 ounce Hessians shall be used for covering. Second hand rice or sugar bags, without holes or patches, are also satisfactory. All burlap must first be liberally coated with a proper mixture of sago flour, water and silicate of soda to prevent the covering from adhering to the rubber. A generous application of this solution must be given to insure proper absorption.

Wrappers—Preference shall be given to shippers who carefully and completely wrap each bale on all sides with equal quality rubber. When wrapper sheets are used talc should be sprinkled on both sides of the wrappers.

FISK RUBBER PLANT INCREASES EMPLOYMENT

Strong evidence of increasing employment is presented in the employment record of the Fisk Rubber Corporation of Chicopee Falls, Mass. On April 1, 1933, the total employment in the Fisk organization throughout the country was 692. On August 19th the number was 3,428 persons, an increase of 2,736 in 141 days.

E. D. Levy, president of Fisk, stated: "Increasing orders for Fisk tires necessitated steady increases in our production schedules. On April 1st we had 692 employees throughout the country; April 12th, 740; April 30th, 1,034; May 6th, 1,552. By June 3rd this number had increased to 2,381; July 1st, it was 2,646; August 5th, 3,255; and by August 19th it had become 3,428—a total increase of 2,736 men and women in 141 days."

Fisk was one of the first to sign the President's Agreement, and is operating under the NRA code.

Goodyear Celebrates Anniversary

More than a thousand Goodyear Tire & Rubber Co. salesmen will travel to the Akron offices Sept. 17, when the company celebrates its 35th anniversary with a homecoming celebration. Branch managers and salesmen from every branch and territory in the entire United States and Canada will attend. Factory representatives to the annual interplant conference also will attend homecoming sessions.

The homecoming will be the first celebration of its kind that Goodyear has sponsored since 1929. Elaborate plans are being made for this year's celebration which was planned, company officials say, because of the "general improvement in the tire business which has been reflected in the last few months."

Plumb Resigns as Secretary

L. J. Plumb has resigned as secretary and treasurer of the Reclaimed Rubber Manufacturers' Association, a position he has held since the formation of the organization several years ago. Mr. Plumb was one of the founders of the association, which was formed shortly after the reorganization of the Rubber Association of America into The Rubber Manufacturers' Association in 1929, at which time reclaimers were no longer eligible for membership in the latter association. At this writing, no one has been selected to succeed Mr. Plumb.

PERSONALS

RAY W. BROWN of the aeronautical department of General Tire & Rubber Co. was chairman of the army liason committee for the International Air Races and Gordon Bennett balloon races held at Curtis-Reynolds airport at Chicago, Sept. 1 to 4.

E. A. STEVENS of the B. F. Goodrich Company purchasing department, has been elected a director of the company's crude rubber buying subsidiary in Singapore. He sailed from San Francisco August 25 for the Straits Settlements. Before he left, Mr. Stevens was married to Miss Dorothy Van Tassell, who accompanied him to the Far East.

He joined Goodrich shortly after his graduation from Yale University in 1928 and following a course of training in crude rubber inspection and laboratory service became a member of the purchasing department.

ROBERT L. MOORE, formerly Chief Chemist of the Thermatomic Carbon Company, Pittsburgh, has become associated as Technical Director of the Marshall Asbestos Corporation, Troy, N. Y., manufacturers of brake lining. Mr. Moore has had over sixteen years' experience with research and process development in the rubber and pigment industries.

W. W. MARTIN, until recently managing director of Societe Francaise B. F. Goodrich, French subsidiary of the B. F. Goodrich Company, has been appointed assistant comptroller of the parent company with headquarters in Akron. Mr. Martin has been associated with Goodrich since 1913. He is succeeded by R. A. Boyer, now in France.

W. H. STEVENS, son of Henry P. Stevens, consulting analytical chemist of 15 Borough High Street, London, England, was recently taken into partnership and the firm name changed to Henry P. Stevens & Son. The younger Mr. Stevens has been connected with the business for over six years.

JOHN W. WHITEHEAD, president of the Norwalk Tire & Rubber Co., Norwalk, Conn., was the principal speaker at a meeting of the Norwalk Rotary Club recently. He explained developments in the NRA movement.

RUBBER EXCHANGE IS FORMULATED IN JAPAN

According to a dispatch to *The Journal of Commerce* on August 10, a plan for the establishment of a rubber exchange in Kobe, Japan, is progressing with a view to facilitating the future dealing in rubber materials. Several representatives of dealers and rubber manufacturers visited similar dealers in Tokio to promote their plans with the aid of the Tokio merchants. They also called on the directors of the Nanyo Rubber Cultivation Society.

Directors of the society felt it necessary to have a similar organization also in Tokio, hence they decided to support the Kobe traders' plan and also to ask the government's sanction for the establishment of an exchange in Tokio.

In addition, the Mitsui and Mitsubishi Trading companies also are in favor of the society's idea, according to the Japanese News Agency.

Henderson Rubber May Organize

Reorganization of the Henderson Tire & Rubber Company, which operated during the World War is under consideration at Bucyrus, Ohio. The plan is being worked out by C. C. Henderson, of Columbus, former head of the company, and the Bucyrus Chamber of Commerce.

Mr. Henderson has taken a 60-day purchase option on the plant of the Shunk Manufacturing Company and issuance of 500 shares of preferred stock and 250 shares of common stock is being arranged. Citizens of Bucyrus are to be asked to subscribe for $50,000 worth of the preferred stock.

Ohio Companies Increase Workers

Many of the smaller Ohio rubber companies have reported large increases in personnel during the past few weeks. The Aetna Rubber Co. of Ashtabula added about 100 men during August, bringing the total to almost 500, according to President S. T. Campbell. Full time operation is expected for the next few months. In Willoughby, the Ohio Rubber Company is now employing 850 workers, according to H. M. Koelliker, factory manager—the largest in the history of the company.

Armstrong to Build

Armstrong Rubber Co., Inc., West Haven, Conn., is preparing to start the construction of a storage building at its plant. The structure will be 80 x 180 feet, two and three stories high, of fireproof construction. The Armstrong company manufactures automobile tires which are sold direct by mail and through dealer outlets, and its business has grown steadily during the past few years. James A. Walsh is president, and Frederick Machlin, secretary and treasurer.

Goodyear on 4-Day Week

It was reported that Goodyear Tire & Rubber Company went on a 4-day week schedule during the first week in September following a decrease in tire demand. Since August 15, Goodyear was said to have laid off 400 men and that about 800 more are scheduled to be released during this month. Other Akron tire plants are still operating on a 5-day week with Mohawk and Seiberling reported to be working 6 days in most departments.

Carbon Black Producers Present Code Covering Labor, Production and Prices

A CODE of fair competition for the Carbon Black Industry was presented to NRA officials in Washington on August 23 by The National Gas Products Association, New York City. This is the first code covering any specific material used in rubber compounding. In addition to detailing the working hours and wages of labor, the code covers the limitation of production, filing of prices quoted and the formation of an emergency national committee to make rules and regulations to make effective the terms of the code.

Article 3 of the code, covering labor, states that no employe engaged in the industry shall be employed for more than 1,088 hours in any twenty-six week period. No employe shall be employed for more than 48 hours in any week, except maintenance and repair employes in case of emergencies. Minimum wages for factory and workers and artisans, are forty cents per hour in Louisiana, fifty cents per hour in Oklahoma and in Stephens County, Texas, and fifty-five cents per hour in all other portions of the United States; for clerical and office employes forty cents per hour.

Employes shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection. No employe and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing or assisting a labor organization of his own choosing.

Production May Not Be Increased

The control of production, covered by Article 4 states that each producer shall, in so far as is possible without infringing now existing obligations for the purchase of gas, so regulate its current production of all ordinary grades of carbon black as to prevent the same from exceeding its current deliveries. In case in any period of six calendar months the quantity of such black held in storage by any producer shall increase (except through purchase of black or unavoidable purchase of gas) such producer shall reduce its storage pro tanto during the six calendar months. It is also considered a violation of the code to make any material increase in the plant capacity of the industry, during the life of the National Industrial Recovery Act.

Regarding prices, Article 5, makes obligatory the filing by each producer with the secretary of the Emergency National Committee, a statement of the minimum price to customers to be quoted for the ordinary grades of carbon black sold by it. No producer shall make or quote any price lower than that filed until five days after filing with the Secretary of the Committee a new minimum price; nor shall any producer or its agent offer or grant any terms, inducements, rebates or conditions having the effect of reducing the cost to the customer below its filed minimum price; nor shall any producer or its agent suggest, intimate or promise to a customer at any time a future price below such minimum price. The Secretary shall immediately notify each producer, by telegraph and by letter, of all initial minimum prices filed and of all price changes thereafter made by any producer.

If the initial minimum price filed by any producer shall be lower than that filed by another producer, such other producer shall have the right to reduce its price to the lower rate by notification to the Secretary of the Committee effective immediately. And upon any existing price being reduced by any producer, upon five days notice as hereinbefore provided, any other producer shall be at liberty to adopt said new minimum price as its own as soon as the same shall become effective, and such producer shall give the Secretary written notice of its adoption of said new minimum price at or before the time such action is taken.

This article also provides for discounts of 5% to jobbers and for the establishment of prices for below standard quality. Prices filed now will not apply to contracts for 1933 delivery made prior to the effective date of the code.

The Emergency National Committee planned in the code will consist of one representative from each producer who is a member of the association. This committee will make rules and regulations, investigate code violations, gather and publish statistics, adopt sales contracts and in general to see that the labor, production and price sections for the code are enforced.

Membership in the National Gas Products Association is open to any producer of carbon black by paying $100 initiation fee and $50 annual dues and by paying its share of the expenses of the association based on the production of each member. Producers of more than 90% of the carbon black manufactured in the United States are said to be members of the association. Officers are Godfrey L. Cabot, President; Oscar Nelson, Vice-President; H. W. Huber, Vice-President; G. A. Williams, Treasurer; R. L. Carr, Secretary; A. F. Kitchel, Assistant Secretary.

Exhibit of Van Cleef Bros. at Chicago World's Fair

THE above illustration shows the attractive exhibit of Van Cleef Bros., Chicago, manufacturers of rubber and chemical products, at the "Century of Progress" Fair in Chicago. One of the features of the exhibit is an electric testing machine, all encased in glass, which tests automatically by means of a high voltage spark gap, the dielectric strength of friction and rubber tape. This testing device forms a part of a display showing many of the raw materials in their original and compounded forms.

A very attractive background, in silver, marbleized brown, blue, black and gray, includes four murals showing the origin of certain materials used in the manufacture of Dutch Brand and Vanitex rubber and chemical products. A series of illustrations also show the application of some of the major products manufactured.

A specially built recessed ceiling is used on which a silhouette map of the world has been painted with the foreign sales agencies shown with little white jewels.

The main products in the exhibit are friction tape, rubber tape, Mask-O tape, soldering paste, patch outfits, Drip-Seal, auto top cement, top dressing, gasket shellac compound, Gask-A-Tex, valve grinding compound, gold and aluminum paint, rubber shoe soles, Van-ite golf balls, hospital sheeting and other products.

The exhibit has in attendance a living replica of the Dutch Brand trademark in native Dutch costume, who has a souvenir for interested visitors.

CHEMICAL EXPOSITION PLANS PROGRESSING

The Fourteenth Exposition of Chemical Industries, to be held in the Grand Central Palace, New York City, during the week of December 4-9, bids fair to exceed all previous expositions in number of exhibitors, instructiveness and interest. Already, according to executives of the exposition management, the number of exhibitors who have taken space exceeds that for any previous chemical exposition at the corresponding period.

Rubber technologists and engineers who attend this year's show are bound to profit by the experience gained by industries in general from the success of various exhibits at the World's Fair in Chicago. The scientific and commercial exhibits at Chicago which showed how things worked or were made proved very popular and as a result exhibitors at the Chemical Show are expected to use action more than in previous years.

Not all exhibits in the past have realized the unique advantages which an exposition affords. For instance, a machine in a catalog is one thing, a machine that you can actually see is another, but a machine that you can see in action, and doing its work, is perhaps the ultimate in industrial process education. So, too, the non-operating exhibits, that is, the chemical products, and material accessories, will make use of the dramatic setting not only of what they are, but what they do, and where. Thus they, too, will be found dynamic, not dull.

Rubber manufacturers will be quick to grasp the opportunities offered by this year's Chemical Show—the first since 1931—and a large attendance from the rubber industry is expected.

RUBBER UNIONS MAKING RAPID GAINS IN AKRON

The rubber union movement has been making rapid strides in the Akron rubber factories with chapters installed in almost every local plant at this writing. Early in August complete unionization of Akron's 40,000 rubber workers was predicted by a representative of the American Federation of Labor. During the month meetings were held of Goodrich, Miller and Philadelphia Rubber Company employees as well as Firestone, Goodyear, Seiberling, American Hard Rubber and Mohawk. Plans were completed early this month for a rubber workers' union charter at the Goodyear plant where a meeting of 600 employees listened to an organizer from the American Federation of Labor. It was planned to install the charter on September 10.

About 75 workers from the Republic Rubber Co. plant at Youngstown joined a rubber workers' union on August 13 and a similar union was organized by Victor Rubber Company employees at Springfield, Ohio, on August 18.

Fisk Cudahy Plant Sold

The Fisk Rubber Co. plant at Cudahy, Wis., was sold in August. Attempts to sell the plant intact to other rubber markers or to mail order houses failed to materialize. The sale was made in the following lots: Parcel 1—Main building and three others, $10,500; parcel 2, one six-story structure and other smaller buildings, $7,000; parcel 3, nine acres of land, $2,100; parcel 4, garage, $5,750; parcel 5, two-story building, $5,750; parcel 6, one story building, $2,750; parcel 7, two-story building, $3,750; parcel 8, 16 acres of land, $3,500. The land and buildings brought $41,500, the total of the sale being about $275,000 or about 3% of its appraised value.

Goodyear Employs 15,944

Goodyear Tire & Rubber Co. announced that on August 15 its factory employes numbered 15,944, which compares with the 1929 average of 16,775 and with August, 1932, figure of 11,091. Since April 1, 6,608 employes have been added to the factory payroll.

With the passing of the peak of the tire buying season Goodyear is now on a five-day week. September employment will depend on tire buying, the company stated.

Superflex Tire Planned

Plans are under way by a committee of business men to assist in the plans for a tire plant in East Palestine, Ohio. The concern is to be known as the Superflex Tire Company and if the business men will take care of the firm's payroll, the firm will finance the purchase of material and machinery. The plans also contemplate the sale of tires in the local territory on a down-payment basis at the time of ordering, the balance being due on delivery. No definite decision has been announced by the committee in charge.

TEXTILE COURSES GIVEN AT COLUMBIA UNIVERSITY

Columbia University of New York announces that comprehensive Evening Textile Courses will be given again this fall. Among the courses, two are of special interest to the rubber industry. One is the course in the "Spinning and Weaving of Cotton Yarns and Grey Goods" which treats with cotton from the bale to the woven grey goods. This course extends over fifteen lectures, one a week, and the first lecture will be given on Friday evening, September 29th, at 7:30 p. m. in Room 410B School of Mines Building at 116th Street and Broadway, New York.

Another course of interest to rubber men, who use textiles in their plants, is the course in the manufacture of "Rayon Yarns and Goods," which is given on Thursday evenings from 7:30 to 9:20 in Room 410B, School of Mines. The instructor in both these courses is Mr. Herbert Mauersberger, a textile consultant of New York, who has given these courses for over seven years. Further information and a descriptive leaflet may be obtained from the Registrar of the university.

Fluctuations in Rubber Limited

At a meeting of the board of governors of Commodity Exchange, Inc., the price fluctuation limitations for rubber, previously fixed at 3c per pound, were changed to 2c per pound, effective on and after August 10th.

TRENTON NEWS

Stockholders and creditors of the Essex Rubber Company, Trenton, N. J., being operated under receivership, have been asked to show cause in Federal Court at Trenton why an allowance for fees to counsel to the receiver should not be allowed. Counsel for one of the creditors claims the receiver will apply for a partial allowance of $10,000 for services rendered and says that the amount is excessive.

Joseph Stokes Rubber Co., Trenton, N. J., is building an addition, 60 by 100 feet, to cost $7,500. The new building will be used for the grinding of dust for hard rubber articles. The company is now operating with three shifts.

Rubber workers employed at the Trenton, N. J., plants recently organized a labor union with a large membership. About 700 employes attended the first meeting when temporary officers were elected. A similar union flourished in Trenton many years ago and was later disbanded.

General C. Edward Murray, Trenton, N. J., president of the Crescent Insulated Wire & Cable Company, recently celebrated his 70th birthday by entertaining members of his family. General Murray was formerly president of the Empire Tire and Rubber Co.

The Thermoid Company, and wholly owned subsidiaries, report that sales for the month of June showed an increase of 31% over May, 1933, and increase of 60% over the same month in 1932. Sales of the Southern Asbestos Co. showed an increase of about 20% during June over May, 1933, and an increase of over 40% for the same month in 1932.

Robert J. Stokes, president of the Thermoid Companies, said: "Our business with the automotive industry has usually tapered off during the month of July, but this year the demand has been well sustained and the business at the moment is very satisfactory and looks up for the next few months."

Murray Rubber Co. is anxious to have the City of Trenton accept 18 acres of land along the Assunpink Creek near its factory for playground purposes as part payment of $50,000 back taxes.

George W. Voorhees, of Trenton, has been retired by the Thermoid Rubber Co., after having been employed for more than fifty years by that company and its predecessor, the Trenton Rubber Co. Upon his retirement he was presented with a smoking set and amethyst ring by his associates at the factory. Mr. Voorhees, who is nearly 68 years old, entered the employ of the old Star Rubber Co., when a youth and later went with the Globe Rubber Co. He quit to become foreman of the hose department of the Thermoid Rubber Co., after it had taken over the Trenton Rubber Co. For many years he was employment manager and general assistant to the factory manager of the Thermoid concern.

The majority of the Trenton rubber companies are operating with extra shifts of employes and longer working hours. The Thermoid Co. has three shifts at work, while the Joseph Stokes, Puritan and Pocono Rubber companies are operating with night shifts.

LEATHER-RUBBER-SHOE DIVISION AMALGAMATION

Merging of the activities of the Hide and Leather Division, Rubber Division, and the Boot and Shoe and Leather Manufactures Division of the Bureau of Foreign and Domestic Commerce into one unit to be known as the Leather-Rubber-Shoe Division has been completed by the Department of Commerce.

Wilbur J. Page, former chief of the Hide and Leather Division, has been designated chief of the new unit. Everett G. Holt, former chief of the Rubber Division, has been named assistant chief. The three divisions which have now been consolidated into one unit were organized in the Bureau several years ago. This consolidation of the three units has been necessitated by the greatly curtailed funds available for trade promotion work. Department officials stated that the fundamental similarity of the work performed by the three units is such that the merger will effect administrative savings without impairment of essential services required by business men.

The same general type of services heretofore made available to the Hide and Leather, Rubber, and Boot and Shoe and Leather manufactures industries will be provided for the respective industries through the newly created unit of the Bureau, it was stated.

Born in Concord, New Hampshire, and educated in the primary and high schools of that city and later graduated from Williams College with an A.B. degree, Mr. Page, after many years' service with American leather concerns at home and abroad, entered the service of the Bureau of Foreign and Domestic Commerce in January, 1919, and was assigned to the office of the American Commercial Attache, Paris.

He was recalled to Washington in September, 1921, and named chief of the newly established Hide and Leather Division in which position he has served until the present reorganization.

Everett G. Holt, assistant chief of the newly organized unit, holds degrees from Colby College and George Washington University. He first entered the service of the federal government in June, 1917, as assistant chief, Examining Division, Civil Service Commission. He transferred from that position to the Bureau of Foreign and Domestic Commerce in October, 1921, as administrative assistant, Rubber Division. Following promotion through several grades, he was named chief of the Division in May, 1926.

Mr. Holt is the author of several monographs on rubber and rubber products. He conducted a first-hand study of crude rubber marketing methods in England, France, Belgium, Netherlands, and Germany in 1927.

ACT TO SAVE AJAX RUBBER PROPERTIES

An effort to postpone payment of approximately $100,000 due the city of Racine, Wis., and the county in taxes on property of the defunct Ajax Rubber Company was launched late in August by L. T. Vance, of Racine, receiver in equity for eastern bondholders.

Otherwise, it was indicated, bondholders will insist on immediate razing of the plant and other properties to realize something on their holdings through sale to a wrecking concern. If payment of taxes can be deferred, Vance said, the receivers will continue their efforts to sell the property to some concern that might renew factory operations.

The book value of the Ajax company, including plant, real estate and equipment, once was placed at between $3,500,000 and $4,000,000. At peak it employed 2,000 workers. The plant covers five and one-half acres. In addition there are 100 duplex houses built by the company for its employees, and 100 small vacant lots.

The company was organized in 1916, and went into receivership in 1931.

A. S. T. M. Standards Changed

Among the existing standards of the American Society of Testing Materials which are to be changed, according to action taken at the recent annual meeting of the society are four specifications for rubber goods. The following are to be replaced by new tentative standards:

Specifications for Wrapped Air Hose for Use with Pneumatic Tools (D46-24).

Specifications for Braided Air Hose for Use with Pneumatic Tools (D60-24).

Specifications for Wrapped Cold Water Hose (D177-24).

Specifications for Steam Hose (D54-31T).

Boston Group Plans Meetings

The Boston Group of the Rubber Division is preparing to enter the 1933-1934 season with a program of interest to all who are associated with rubber goods manufacturing, processing and technology, according to an announcement by Secretary J. J. Sindler, of The Converse Rubber Co., Malden, Mass.

The present policy of holding two or more yearly meetings will be continued and a program of broad interest will be presented. Each meeting will consist of a dinner, followed by the presentation of papers, and a suitable period for discussion of the subject material. The speakers for these meetings will be authorities in their respective fields and the programs will be planned so as to be of interest and value not only to chemists and engineers but also to those interested in the more general fields of merchandising and selling. Those desiring to join the Group may become members by paying annual dues of $1.00.

Falls Workers Strike

Sixty workers of the Falls Rubber Co. walked out on August 16 as a protest against the layoff of about 20 employes. Officials of the company announced that they were forced to cut the staff because of decreasing production demands.

Tractor With Air Balloons Makes New Record

Tractor Which Set Record of 35.4 Miles Per Hour Frank Brisko at Wheel—At Left, Brisko's Racing Car

ENTHUSIASM of farmers for pneumatic tired tractors is making tractor manufacturers seek higher speeds to make the tractor more valuable for hauling or travel, and for use as an all-purpose farm machine. The most interesting speed performance is the recent official American Automobile Association (AAA) record of 35.4 m.p.h. for five miles made by a tractor at the Wisconsin State Fair Grounds A. A. A. race.

Thousands of people watched Albert Schroeder, a prominent Waukesha County, Wisconsin farmer, using a new Allis-Chalmers standard farm tractor equipped with the new Firestone Low Pressure Tractor Tire, plow several rows of the hard uneven ground inside the race track oval. Mr. Schroeder then unhitched the plow and turned the tractor over to Frank Brisko, famous race driver, who was one of the two leaders in the first 100 miles of the Indianapolis race this year. The crowds were amazed to see the tractor streak down the straight stretches—at times traveling 40 miles an hour.

A new four-speed transmision development combined with the pneumatic low pressure tire development made possible this unheard of speed.

At the end of the run, Frank Brisko, asked how he liked the ride, said, "It was just like driving a passenger automobile."

The new highway speed and comfort now available in farm tractors shows how completely the tractor with these big tires, serves as an all-purpose machine. Demonstrations in all parts of the country have proved to farmers that tractors using these tires give greater fuel economy in farm operations, greater traction, do not pack seed beds, make the farmer's work easier, and save time as well as money.

Intercontinental Rubber

Intercontinental Rubber Co. and subsidiaries report for six months ended June 30, 1933, loss from operations of $102,891 after taxes, depreciation, etc., and a net loss of $41,650 after giving effect to credits of $10,991 for inventory adjustments and $50,250 for appreciation in value of short term notes. This compares with net loss of $162,868 in the first half of 1932.

Current assets as of June 30, 1933, including $237,752 cash, amounted to $549,274 and current liabilities were $23,293. This compares with current assets of $842,547 and current liabilities of $23,664 on June 30, 1932.

National Rubber Machinery

According to the *Wall Street Journal*, domestic business of the National Rubber Machinery Co. was somewhat better for the first half of this year than for the like period last year, and export business was 30% better than the corresponding period of 1932.

As of June 30, 1933, the unaudited statement shows total assets and liabilities of $1,809,440. Current assets were $478,339 as against current liabilities of $155,607. It shows cash on deposit and on hand of $96,873, trade receivables of $292,894 from which is taken nearly 8% for collection losses reserve. Inventories stand at $107,124.

Rubber Mooring Buoys

The Royal Air Force of Great Britain is experimenting with rubber mooring-buoys for seaplanes and flying-boats. The advantage of using rubber for this purpose is that its resilience prevents injury to the aircraft and the buoy itself when one fouls the other. Such accidents have been not uncommon in the past; at Calshot, for example, seaplanes have sometimes been damaged when the wash from a liner has drifted them against a buoy.

The new buoy has been designed by Short Brothers, who build flying-boats and seaplanes at Rochester, and is manufactured by the Silvertown Co. It is made of spongy rubber treated to withstand the action of salt water and tropical heat. The results of tests already made in home waters are stated to be satisfactory, and the Air Ministry has ordered a further supply for trial under tropical conditions in the East. The invention is also being adopted outside the Royal Air Force, and the Medway Conservancy has placed a large order for rubber buoys for the mooring of river craft on the Medway.

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Financial News

Lee Rubber & Tire Corp.

Lee Rubber & Tire Corp.'s fiscal year ending October 31 will be a profitable one despite the loss of $195,159 reported for the six months ended April 30, J. J. Watson, president, believes.

"We expect that final figures for the nine months ended July 31 will show that the company in its third quarter either wiped out the first six months' loss or came very close to it," he declared.

Since April and continuing to the present, Lee's plants have been operating at or near capacity, and sales for the current fiscal year will exceed those of last year ($6,411,099) if the present rate continues, "and I believe it will," Mr. Watson said.

Since October 1, 1932, Lee Rubber has bought about 12,000 shares of its capital stock and now has in its treasury approximately 38,000 shares it has bought to retire, acquired, Mr. Watson said, at prices averaging around $3. At present, Lee has about 262,000 shares outstanding, excluding treasury stock.

The company has a $200,000 bank debt at present but has mostly been free of such debt since its last report and now has $800,000 in cash on deposits, Mr. Watson stated. Lee Rubber has no funded debt.

Kelly-Springfield

Kelly-Springfield Tire Co. reports for six months ended June 30, 1933, net loss of $744,267 after taxes, depreciation, interest, losses on foreign exchange, etc., comparing with net profit of $57,101 in first half of 1932.

"The loss was due to the most severe price war in the history of the rubber industry, supplemented by generally unsettled business conditions prevailing during the first four months of the year," the company said. "Since April operations have been on a profitable basis.

"The company has an advantageous position in rubber and fabric at prices substantially below the current markets."

General Tire & Rubber Co.

If its current rate of business continues, General Tire & Rubber Co. will gross around $16,000,000 to $18,000,000 in 1933, according to William O'Neil, president. In 1932, the company's sales were $16,679,000.

For the six months ended May 31, the first half of its fiscal year, the company lost money, Mr. O'Neil said. Beginning with May, however, General has had a monthly profit of around $300,000 to $400,000, he said. The capitaliztaion of General Tire consists of $3,161,500 of 6% preferred stock on which no dividends have been paid since March 31, 1932, and 83,893 shares of common stock.

Raybestos-Manhattan, Inc.

Raybestos-Manhattan, Inc., earned a profit of $292,825.10, equivalent to 46c per share on net sales of $2,727,891.23, during the quarter ended June 30, 1933, comparing with a loss of $106,727.65, upon sales of $2,155,602.80, during the same quarter in the year prior. During the six months ended June 30, 1933, the company earned a net profit of $229,396.59, or 36c per share, on sales of $4,512,570.75. In the same period in 1932 the company incurred a net loss of $117,600.10 on sales of $4,516,679.29. Net current assets at June 30, 1933, were $6,236,601.59, of which $3,086,862.10 represented cash and marketable securities. The directors declared a dividend of fifteen cents per share, payable September 15, 1933, to stockholders of record on August 31, 1933.

Monsanto Earnings Increase

The second quarter report of the Monsanto Chemical Company issued on July 26 states that earnings for the quarter after all charges were $542,027, equivalent to $1.26 a share compared to 60 cents a share for the same quarter last year. Earnings for the half year amounted to $838,947 or $1.96 a share compared to $1.24 for the first six months of 1932. The regular quarterly dividend on the $1.25 annual basis was declared.

On August 1 the company announced the retirement on September 30, 1933, of $200,000 face value of its 5½% First Mortgage Sinking Fund Gold Bonds due 1942. This redemption is in addition to sinking fund retirements which are being met annually. Expansion of business and ample liquid resources warrant the anticipation of a substantial part of its funded debt, according to a statement issued by Monsanto.

Thermoid Co.

Thermoid Co. and wholly owned subsidiaries report for quarter ended June 30, 1933, net profit of $103,773 after taxes, depreciation, interest, etc., equivalent after allowing for dividend requirements on 31,578 shares of 7% preferred stock, to 19 cents a share on 256,056 shares (par $1) of common stock. This compares with net loss of $103,363 in preceding quarter and net profit of $25,716 or 81 cents a share on preferred stock in June quarter of previous year.

For six months ended June 30, 1933, net profit was $410 after taxes and charges, equal to one cent a share on preferred stock comparing with net loss of $80,970 in first half of 1932.

In addition to the above net profit there was a credit to surplus of $42,170 through acquisition of the company's gold notes at discounts.

DuPont Increases Earnings

Net earnings of E. I. du Pont de Nemours & Co. for the second quarter of 1933 after all charges were $7,452,122, equal to 68c a share on the 10,918,063 common shares. This compares with net earnings equal to 27c a share in the June quarter of last year.

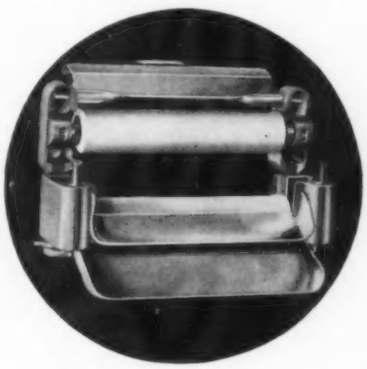
The report for the first half of the year showed net profits of $11,277,500, equal to $1.03 per share, of which 46c was derived from dividends on the company's holdings of General Motors common stock. This compared with $10,962,167, or $1.01 a share for the first half of last year, including 69c a share from General Motors.

The company's total current assets were $125,401,107, and total current liabilities $11,474,984.

New Rubber Goods

Rubber Fingers in Washer

The latest model Zenith washer made by the Zenith Machine Co., Duluth, Minnesota, has a novel application of rubber consisting of a clothes agitator made of rubber fingers as illustrated. This agitator has soft, flexible rubber "hands" which work on the



clothes without danger of tearing. The washer also uses an improved wringer with divided rubber rolls and some models use a rubber mounted porcelain tub.

Special Oxford for Badminton

The growing interest in the game of Badminton has resulted in a special shoe, called the Vita-Ray Mesh Oxford, made by the Cambridge Rubber Co., Cambridge, Mass. This shoe is durable and strong but light

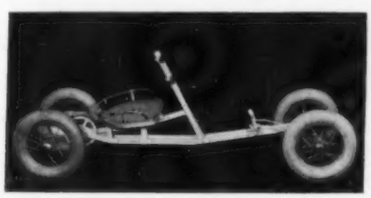
in weight. It is designed to properly support the foot with a snug, glove-like fit achieved by the lace-to-toe pattern, and particularly the Camco Ankle Support Strap, a patented feature of great importance originally conceived by English players. Additional comfort and snugness necessary to fast and accurate footwork is secured by sponge rubber heel seats and metatarsal pads. The unusual feature of mesh ventilation adds to the comfort and lightness, although the shoe is also made with fabric uppers ventilated by air holes at the toes.

Firestone Rub-Strakes

The Mechanical Goods Department of Firestone Tire & Rubber Co. has brought out a line of rubber rub-strakes, in colors and in various shapes for all types of boats. Rub-Strakes prevent hull abrasions, loosened planking, strained frames. They cost less in the long run than wood or metal guards, do not scar nor dent, and never need polishing. The half-round section is recommended for pleasure craft, and the full-round white rub-strake for dinghies. Both prevent small craft from scratching paint of costly yachts. Other types are used as moldings, or to replace guard rope on rowboats, or as a bow strip on every kind of craft. Large sizes for landing floats and docks are also available.

Irish Mail Speedster

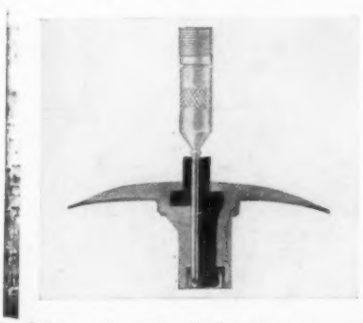
The Hill-Standard Corp., Anderson, Indiana, recently brought out a speedster for children having as equipment non-skid single tube 2½ inch pneumatic tires with a Schrader valve. The wheels have tangent spokes,



specially made and equipped with ball bearings. It has been termed "The Rowing Machine on Wheels."

All-Rubber Valve

The Seamless Rubber Co., New Haven, Conn., has announced an all-rubber valve of new design for balls used in football, basketball and other sports. The new valve provides for easy inflation or deflation with an

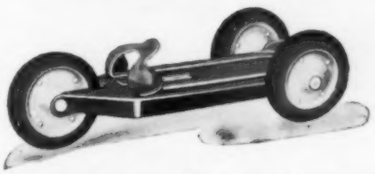


air-tight seal, and eliminates many of the "headaches" formerly connected with the task. In connection with the valve, the Seamless company has also announced a new football bladder molded in one piece to conform to the exact contour of the ball.

The "foolproof" valve consists of a molded housing of fine white rubber which is either vulcanized into the bladder or is screwed on, two different types being made. An expansion plug of live rubber larger than the opening in the housing is permanently inserted at the factory, being considerably stretched during the inserting.

A threaded metal needle slips readily between the expansion-plug and its housing for quick deflation or inflation. As the needle is withdrawn, the expansion plug expands behind it. The elastic plug, seeking to expand to its original size, tightly closes the housing, thereby hermetically sealing the bladder.

Brinkman Scooter Skate



The new scooter skates brought out by the Brinkman Engineering Company, Dayton, Ohio, use oversize live rubber wheels to eliminate noise. The skate is rigidly constructed and has a toe clip which makes a strap unnecessary.

ASKS INVESTIGATION OF AKRON FACTORY LAYOFFS

Gen. Hugh S. Johnson, NRA administrator, was asked early this month by Congressman Dow Harter to investigate reports that Akron rubber companies are discharging resident home owners and retaining "footloose" youths and that huge layoffs are planned by the companies as soon as a large stock of tires has been accumulated. The accusations were originally made by the *Akron Beacon Journal* in an editorial. Those factory executives who could be reached stated that decreased demand made layoffs necessary and that additional discharges would be made as demand for their products decreased. They denied that any discrimination was shown for youths as against the older local employees.

Hearing for New India Suit

Early hearing of a motion to forestall any move to sell India Tire & Rubber Co., now operating in receivership, was indicated late in August. Judge L. S. Pardee, who granted leave to the Cleveland law firm of Rocker & Schwartz to file the sale protest, will hear the plea after prosale factions have had an opportunity to file answers, it was announced.

The motion asks that Paul C. Weick, receiver, be instructed to reject all offers, and continue operations, "in interest of stockholders and creditors." It points out that operating profit has been made under receivership.

Vegetables for Goodrich Workers

More than 14 tons of vegetables were distributed to workers on the industrial cooperative gardens of the B. F. Goodrich Co., late in August, it was reported to A. C. Sprague, employment manager. The distribution, which totaled 28,461 pounds, included 7,680 pounds of green beans, 1,542 pounds of beets, 3,377 of sweet corn, 8,135 of tomatoes, 1,548 of turnips, 1,888 of summer squash, 516 of mustard greens, 285 dozen ears of sweet corn and 163 dozen peppers.

INDUSTRIAL RESEARCH LABORATORIES OF THE U. S., August, 1933. Fifth Edition, Paper Cover. 223 pages, including index. Price $2.00. Compiled by Clarence J. West and Callie Hull. Published as Bulletin 91 by The National Research Council of The National Academy of Sciences, Washington, D. C.

As in previous editions of this bulletin, the material was furnished by the directors of the laboratories, and may be considered correct as of January 1, 1933. In the attempt to contact new laboratories, use was made of membership lists of technical societies, published articles from research laboratories in technical periodicals and notices of the revision in these same publications. This edition contains information regarding 1,575 industrial and consulting laboratories as compared with 1,625 in the fourth edition. About 170 laboratories have been included for the first time, although this does not mean that these laboratories have been established since the last bulletin was published. The data regarding personnel contained in this bulletin afford some very interesting facts regarding the effect of the past three years upon the research staffs of the laboratories reporting.

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THE RUBBER INDUSTRIES. Report of the Census of Manufactures. For sale by the Superintendent of Documents, Washington, D. C. Price 5 cents. Paper cover pamphlet; 10 pp.

This is a census report on rubber tires and inner tubes, boots and shoes, rubber, rubber goods other than tires, inner tubes, and boots and shoes, for the year 1931. It contains statistics on wage earners and wages, cost of materials, value of products, value added by manufacture, and consumption of crude rubber.

EMPLOYEE PICNICS DRAW HUGE CROWDS

Picnics or outings held last month by a number of rubber companies from the Akron district drew over 100,000 workers. The largest was that held by Goodyear at Euclid Beach Park, Cleveland, on August 21 where between 50,000 and 65,000 employees enjoyed the amusements and sports. The annual Goodrich outing was held on August 14 at the same beach and over 40,000 were on hand. In addition to the sports and games, beauty contests, motor parades and bathing revues were held. The Seiberling picnic was held at Meyers Lake in Canton on August 28 and over 4,500 employees and their families attended. In Youngstown, on August 23, about 2,500 attended the annual outing of Republic Rubber Company employees.

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L. J. SCHOTT CO.

P. O. BOX 124, E. AKRON STAT.

AKRON - - - - OHIO

Buyers of Surplus and Obsolete Rubber Chemicals, Colors, Fabrics, &c.

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REVIEW SHELF

• Monthly Review of New Books, Pamphlets, Company Catalogs, Service Bulletins, House Organs, etc., Pertinent to the Industry.

ZINC OXIDE IN RUBBER. By Harlan A. Depew, American Zinc Sales Company, Columbus, Ohio. Paper cover booklet, 30 pp. Reprint of papers from April and May, 1933, *Industrial and Engineering Chemistry*.

This booklet, after showing that the trend in the rubber industry is for zinc oxide to follow the consumption of rubber, describes the properties, choice and manufacture of zinc oxide in three separate chapters.

Under the heading "Chemical and Physical Properties of Zinc Oxide and Their Relation to Rubber-Making Properties," it is shown that zinc oxide for rubber compounding is essentially a chemical ingredient and the acidity (sulfur trioxide) plays an important part in the reactions that occur during vulcanization, the acidity preventing undesirable protein reactions. Other chemical ingredients to be considered are small amounts of lead, calcium, and fatty acid. The physical properties that affect the behavior of zinc oxide in rubber are particle size, uniformity of size, and particle shape; these influence the incorporation of the zinc oxide in rubber and the reenforcement when large amounts are used.

The next section deals with the "Choice and Testing of Zinc Oxide for Rubber Compoundnig." An abstract of this follows: The choice of a zinc oxide for rubber compounding depends on the methods of factory processing, the kind of products made, and the type of formulas that are compounded. In choosing a zinc oxide, it is desirable to use rubber tests. Present-day uniformity of shipments is high, but, if uniformity tests are desired, pigment tests, including analytical and microscopic, may be used.

The last section describes the manufacture of Zinc Oxide from the selection of the ores, their concentration and roasting through the various steps to the completed products. Both the American and French processes are described.

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A KEY TO INDUSTRIAL RECOVERY, by Allen W. Rucker in collaboration with N. W. Pickering, president of Farrel-Birmingham Company, Inc., Ansonia, Conn. Pamphlet, paper cover. Published by Farrel-Birmingham Company, Inc.

This pamphlet is a discussion of the effect of the National Industrial Recovery Act on industry. The authors maintain that increased productivity per worker through more efficient machinery is and must be industry's answer to higher wages and the shorter work week. They show, with the aid of statistics, that over a long term, both the number of workers employed and the average annual earnings per worker tend to increase in those industries which are most advanced in new processes and improved machinery.

THE PREPARATION AND CRYSTALLIZATION OF PURE ETHER-SOLUBLE RUBBER HYDROCARBON: COMPOSITION, MELTING POINT, AND OPTICAL PROPERTIES. By W. H. Smith, Charles Proffer Saylor and Henry J. Wing of the Bureau of Standards. Paper cover booklet. 18 pp. For sale by the Superintendent of Documents, Washington, D. C. Price 5 cents.

The authors discuss rubber hydrocarbon under the following heads: 1—Purification and Crystallization of Rubber Hydrocarbon. 2—Microscopical Study of Crystalline Rubber. 3—Determination of the Composition of Pure Ether-Soluble Rubber Hydrocarbon. Rubber Hydrocarbon from latex was purified by a method which involved the use of trypsin to remove protein adsorbed on the rubber particles. The natural antioxidants which always occur in crude rubber were used to protect the rubber during purification. The ether-soluble portion of the purified rubber was crystallized from dilute solutions at low temperatures. A special apparatus was devised for the microscopical examination of the crystalline hydrocarbon. By its means, the growth of crystals was witnessed, and the melting point and refractive indices were determined.

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PRICES VS. PRODUCTION, Number 2 in a series of booklet-editorials by Allen W. Rucker in collaboration with N. W. Pickering, president of Farrel-Birmingham Company, Inc. Issued by Farrel-Birmingham Company, Inc., Ansonia, Conn. Pamphlet; paper cover; 12 pp. For free distribution.

Present day business problems are discussed under the following heads: The Problem of Declining Production; Effects of Volume; Brakes on Business Turnover: The Declining Spiral; Mischief Making; Retail Margins Widened; Thought Barriers; Artificial Means Unnecessary; Price Equalization Desired.

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THE LIBERIAN CRISIS, by Henry Litchfield West, president of the American Colonization Society. May, 1933. Published by the American Colonization Society, Colorado Building, Washington, D. C. Paper cover booklet; 33 pp.

Under the following heads, the author sets forth the reasons why critical conditions have arisen which threaten the stability of the Republic of Liberia: Liberia the Nation's Ward; American Philanthropy and Industry; Liberia and the League of Nations; Liberia Defies the United States; Liberia and Its Future.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, SEPTEMBER 10, 1933

Crude Rubber

AFTER the average high of 8.01 cents during July, rubber dropped to an average of 7.31 cents during August on the outside market with a high of 8 and a low of 6⅞ cents. The month ended with a steady market around 7¼ cents which has since weakened again to under 7 cents during the first week of this month. The tendency has been for the market to follow outside commodities, especially wheat, and securities. Restriction talk has apparently been discounted but its effect has been felt in the market by the liquidation which was indulged in by the speculative interests which had counted on continued rising prices several weeks ago based on agreement on restriction. On the exchange, trading has been light with prices closely following the above. Selling developed early this month bringing outside quotations down to an asking of 6 9/16 and spot on the exchange to 6.50 on the 9th. Quotations on the outside market, Commodity Exchange, London and Singapore, as of September 9 follow:

Plantations—

Ribbed Smoked Sheets—			
Spot	—	@	.07
September	—	@	.07
Nov.-Dec.	—	@	.07 1/16
First Latex, crepe spot	—	@	.08
Amber Crepe, No. 2	—	@	.05⅝
Amber Crepe, No. 3	—	@	.05¼
Amber Crepe, No. 4	—	@	.05⅛
Brwon Crepe, clean thin	—	@	.05⅜
Brown Crepe, rolled	—	@	.04½

Latex—

Liquid Latex, per gal.	.72	@	—

Paras—

Up river, fine	.09½	@	—
Acre Bolivian, fine	.10	@	—
Caucho Ball, Upper	.09	@	—

Balata—

Block, Ciudad	—	@	.25

LONDON MARKET

Standard Smoked Sheets—Buyers—Sept. 11

September	—	@	3 11/32d
Oct.-Dec.	—	@	3 11/32d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—Sept. 11

September	—	@	3 7/16d
Oct.-Dec.	—	@	3 7/32d

Reclaimed Rubber

Demand for reclaim at the moment is off somewhat from the peak of July and prices have eased slightly. Labor troubles and strikes at some of the smaller rubber plants caused some slowing up in reclaim requirements but this situation has now cleared up. The percentage of reclaim to crude used in July rose to 20.6 compared to 18.8 in June and although consumption in August will be lower it is not expected that the percentage will decrease. Quotations follow:

High Tensile

High Tensile Red	lb.	.06¾	@	.07
Super-Reclaim Black	lb.	.07	@	.07½

Shoe

Washed	lb.	.08	@	.09
Unwashed	lb.	.06¾	@	.07

Tube

No. 1 (Floating)	lb.	.11	@	.11½
No. 2 (Compounded)	lb.	.06¼	@	.06½

Tires

Black	lb.	.04¾	@	.05
Black, selected tires	lb.	.05¼	@	.05½
Dark Gray	lb.	.06¼	@	.06½
Light Gray	lb.	.07	@	.07½
White	lb.	.07½	@	.07¾
Truck, Heavy Gravity	lb.	.05¾	@	.06
Truck, Light Gravity	lb.	.06¼	@	.06¾

Miscellaneous

Mechanical blends	lb.	.04	@	.04½

Scrap Rubber

Prices have eased off in general during the past month with the exception of footwear stocks which jumped between $3.00 and $4.00 a ton. Dealers are reluctant to sell at the lower quotations in anticipation of higher prices later in the season. Only a small part of surplus stocks are being turned over. Current quotations follow:

(Prices to Consumers)

Auto tire peelings	ton 23.50	@	25.00
Mixed auto	ton 11.50	@	13.00
Clean solid truck tires	ton 27.50	@	30.00
Boots and shoes	ton 27.50	@	30.00
Arctics, untrimmed	ton 20.00	@	22.50
Inner tubes, No. 1	lb. .05	@	.05¼
Inner tubes, No. 2	lb. .02½	@	.02¾
Inner tubes, Red	lb. .02⅞	@	.03

Cotton

The government crop report of 12,314,000 bales for August was somewhat above the average of private estimates with the result that prices dropped considerably. The average New York spot price for August was 9.55 compared to 10.76 for July and so far this month the average is closer to 9.15. Futures are off also, October closing at 8.88 on Sept. 11 compared to 9.96 a month ago. Buying lately has been more active, influenced largely by talk of inflation and a more favorable long range statistical situation and reports of continued control of cotton production for next season. It is expectel in some quarters that the carry-over into next season will be around 2,000,000 bales and that the 1934 crop will be the smallest in more than a decade. Quotations on the N. Y. Cotton Exchange follow:

	Aug. 10	September 11		
	Close	High	Low	Close
October	9.96	8.96	8.65	8.88
December	10.19	9.18	8.88	9.09
May	10.57	9.61	9.31	9.50

Tire Fabrics

(Prices Net at the Mill—Process Tax Included)

Peeler, carded, 23/4/3	lb. .39	@	—
Peeler, carded, 23/5/3	lb. .41¾	@	—
Peeler, carded, 13/3/3	lb. .38¾	@	—
Peeler, carded, 15/3/3	lb. .39¾	@	—
Egyptian, carded, 23/5/3	lb. .52¾	@	—
Egyptian, combed, 23/5/3	lb. .57¾	@	—

CHAFERS

Carded, American, 1 1/16"	lb. .39	@	.40
Carded, American, 1"	lb. .32	@	—

LENO BREAKER

Carded, American, 1 1/16"	lb. .39	@	.40
Carded, American, 1"	lb. .33	@	—

Sheetings

40 inch, 2.50 yard	yd.	.11¼	@ —
40 inch, 2.85 yard	yd.	.09¼	@ —
40 inch, 3.15 yard	yd.	.11	@ —
40 inch, 3.60 yard	yd.	.09⅝	@ —
40 inch, 3.75 yard	yd.	.08	@ —
40 inch, 4.25 yard	yd.	.07⅝	@ —

Ducks

Enameling	lb.	.32	@ .33
Belting and Hose	lb.	.30	@ —
Single filling, A grade	lb.	.16	@ .16½
Double filling	lb.	.17	@ .17½

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 Tons

FROM AUGUST 11 TO SEPTEMBER 11

Date		Spot	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sales
Aug.	11	7.38	7.38	7.57	7.76	7.94	8.13	8.22	8.30	8.38	8.49	8.60	8.70	8.80	——	469
	12	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	13	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	14	7.00	7.00	7.13	7.32	7.51	7.70	7.79	7.87	7.95	8.07	8.20	8.30	8.40	——	448
	15	7.19	7.20	7.30	7.48	7.65	7.82	7.89	7.98	8.09	8.19	8.30	8.40	8.50	——	252
	16	6.75	6.65	6.80	6.95	7.16	7.38	7.42	7.49	7.57	7.70	7.85	7.95	8.05	——	620
	17	7.16	7.25	7.35	7.53	7.71	7.89	7.98	8.06	8.15	8.26	8.37	8.47	8.57	——	437
	18	7.07	7.05	7.15	7.32	7.49	7.70	7.76	7.85	7.95	8.06	8.17	8.27	8.37	——	446
	19	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	20	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	21	7.22	7.20	7.23	7.33	7.55	7.78	7.85	7.95	8.05	8.15	8.25	8.36	8.47	——	352
	22	7.00	7.00	7.11	7.29	7.47	7.66	7.77	7.87	7.98	8.11	8.24	8.35	8.46	——	211
	23	7.13	7.15	7.25	7.43	7.61	7.80	7.95	8.07	8.21	8.31	8.42	8.53	8.64	——	304
	24	7.13	7.10	7.22	7.36	7.53	7.71	7.84	7.98	8.12	8.24	8.37	8.49	8.61	——	239
	25	7.35	7.45	7.53	7.69	7.86	8.03	8.17	8.31	8.45	8.57	8.69	8.81	8.93	——	399
	26	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	27	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	28	7.25	7.30	7.32	7.50	7.65	7.81	7.96	8.10	8.25	8.37	8.50	8.62	8.74	——	254
	29	7.23	——	7.27	7.43	7.60	7.76	7.85	8.04	8.23	8.35	8.48	8.61	8.74	——	277
	30	7.05	——	7.14	7.30	7.46	7.62	7.77	7.92	8.08	8.20	8.32	8.45	8.57	——	285
	31	7.13	——	7.28	7.42	7.56	7.71	7.85	7.99	8.14	8.27	8.40	8.50	8.60	——	137
Sept.	1	7.19	——	7.25	7.41	7.57	7.74	7.89	8.05	8.17	8.29	8.42	8.52	8.62	8.72	77
	2	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	3	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	4	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	5	7.00	——	7.10	7.12	7.28	7.45	7.61	7.77	7.93	8.06	8.20	8.33	8.45	8.55	138
	6	7.00	——	7.09	7.19	7.34	7.52	7.66	7.79	7.92	8.03	8.15	8.28	8.41	8.52	252
	7	6.94	——	6.87	6.99	7.10	7.22	7.35	7.47	7.62	7.72	7.82	7.96	8.11	8.22	242
	8	6.63	——	6.60	6.73	6.86	6.99	7.10	7.22	7.35	7.49	7.63	7.74	7.85	7.96	583
	9	6.50	——	6.53	6.65	6.80	6.91	7.00	7.15	7.30	7.42	7.53	7.65	7.80	7.95	157
	10	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	11	6.94	——	6.91	7.04	7.16	7.28	7.42	7.53	7.66	7.76	7.86	8.00	8.15	8.27	394

Rubber CHEMICAL Markets

NEW YORK, September 11, 1933

ACCELERATORS

Organic				
A-1	lb.	.24	@	.27
A-5-10	lb.	.33	@	.36
A-7	lb.	.55	@	.59
A-11	lb.	.62	@	.66
A-16	lb.	.57	@	.61
A-19	lb.	.58	@	.62
A-32	lb.	.80	@	.95
Aldehyde ammonia, crystals	lb.	.65	@	.67
Altax	lb.			
Captax	lb.			
Crylene	lb.	.55	@	.65
paste	lb.	.45	@	.55
Di-Ortho-Tolyguanidine	lb.	.42	@	.43
Diphenylguanidine	lb.	.33	@	.34
Ethylidene aniline	lb.	.45	@	.47½
Formaldehyde aniline	lb.	.37½	@	.42
Guantal	lb.	.42	@	.51
Heptene	lb.	.40	@	—
Hexamethylene-tetramine	lb.	.37	@	—
Lithex	lb.	.18	@	.20
Methylenedianiline	lb.	.36	@	.37
Monex	lb.	3.25	@	—
Oxynone	lb.	.68	@	.80
Phenex	lb.	.50	@	.55
Pipsol X	lb.	3.55	@	4.00
R & H 40	lb.	.40	@	.41
R & H 50	lb.	.40	@	.41
R-2	lb.	1.95	@	2.15
R-2 Base	lb.	4.55	@	5.00
Safex	lb.	1.20	@	1.25
SPDX	lb.	.75	@	—
Super-Sulphur No. 1	lb.			
No. 2	lb.			
Thiocarbanilid, drums	lb.	.25	@	.27
Trimene	lb.	.75	@	—
base	lb.	1.20	@	—
Triphenylguanidine	lb.	.58	@	.60
Tuads	lb.			
Ureka	lb.	.75	@	1.00
Ureka C	lb.	.58	@	.69
Vulcanex	lb.			
Vulcone	lb.			
Vulcanol	lb.			
Z-88-P	lb.	.50	@	.60
Zimate	lb.			
Inorganic				
Litharge, domestic	lb.	.05¾	@	—
Magnesia, calcined,				
light	per 100 lb.	5.35	@	5.45
heavy	per 100 lb.	3.65	@	3.75

COLORS

Blacks (See Compounding Materials)				
Blues				
Prussian	lb.	.36	@	.37
Ultramarine	lb.	.06	@	.30
Browns				
Sienna, Italian	lb.	.04	@	.08
Umber, Turkey	lb.	.04	@	.06
Greens				
Chrome, light	lb.	.23	@	.26
medium	lb.	.26	@	.28
dark	lb.	.28	@	.33
Chromium Oxide, bbl.	lb.	.23	@	.27
Reds				
Antimony				
crimson, 15/7	lb.	.40	@	—
sulfur, free	lb.	.52	@	.56
Indian English	lb.	.09	@	.10
Domestic (Maroon)	lb.	.11	@	—
Red oxide, pure	lb.	.10	@	.12
Rub-Er-Red, f.o.b. Easton	lb.	.08¾	@	—
Whites				
Cryptone CB, No. 21	lb.	.06½	@	.06¾
Cryptone, No. 19	lb.	.06½	@	.06¾
Lithopone, Albalith	lb.	.04½	@	.04¾
Lithopone, Azolith	lb.	.04½	@	.04¾
Titanium oxide	lb.	.17	@	.19
Titanox B	lb.	.06	@	.06½
Titanox C	lb.	.06	@	.06½
XX Zinc Sulphide, bbls.	lb.	—	@	.13
Zinc Oxide—American Process				
American Azo:				
ZZZ (lead free)	lb.	.05¾	@	.06
ZZ (leaded)	lb.	.05½	@	.05¾
Horsehead Lead Free Brand:				
Selected	lb.	.05¾	@	.06
Special	lb.	.05¾	@	.06
XX Red	lb.	.05¾	@	.06
XX	lb.	.05¾	@	.06
XX Green	lb.	.05¾	@	.06
Leaded Brand, Standard	lb.	.05½	@	.05¾
Sterling	lb.	.05½	@	.05¾
Superior	lb.	.05½	@	.05¾
Lehigh	lb.	.05¼	@	.05½
U. S. P., bbls.	lb.	—	@	.12¾
Kadox, black label	lb.	.09⅝	@	.09⅞
Blue label	lb.	.08⅝	@	.08⅞
Red label	lb.	.07¼	@	.07½
St. Joe, black label	lb.	.05¾	@	.06
green label	lb.	.05¾	@	.06
red label	lb.	.05¾	@	.06
Zinc Oxide—French Process				
Anaconda, lead free	lb.	.05¾	@	.06
Anaconda, selected lead free	lb.	.06¼	@	.06½
Florence White seal, bbls.	lb.	—	@	.10⅞
Green seal	lb.	.09⅝	@	.09⅞
Red seal	lb.	.08⅝	@	.08⅞
Yellows				
Chrome	lb.	.16	@	.16½
Ocher, dom. med.	lb.	.01½	@	.02

BLACKS

Arrow "Aerfloted"				
c.l. f.o.b. works, bags	lb.	.02¾	@	—
c.l. f.o.b. works, cases	lb.	.04¼	@	—
less c.l. f.o.b. works	lb.	.05¼	@	.07
Arrow "Aerfloted" Specification, c.l. f.o.b. wks., bags	lb.	.03	@	—
Bone, powdered	lb.	.05½	@	.12½
Carbon, compressed	lb.	.02¾	@	.07
uncompressed	lb.	.02¾	@	.07
"Certified," Cabot				
c.l. f.o.b. works, bags	lb.	.02¾	@	—
c.l. f.o.b. works, cases	lb.	.04¼	@	—
less c.l. f.o.b. works	lb.	.05¼	@	.07
Spherons	lb.	.02¾	@	—
"Disperso" f.o.b. La.	lb.	.028	@	.071
f.o.b. Texas	lb.	.02¾	@	.07
Drop, bbls.	lb.	.05½	@	.14
"Excello," compressed	lb.	.03	@	—
"Fumonex"	lb.	.03	@	.07
"Gastex"	lb.	.03	@	.07
Lampblack	lb.	.06	@	.08
"Micronex"				
c.l. f.o.b. works, bags	lb.	.03	@	—
c.l. f.o.b. works, cases	lb.	.04½	@	—
less c.l. f.o.b. works	lb.	.05½	@	.07
"Supreme"	lb.	.02¾	@	—
Thermatomic—"P 33"	lb.	—		—
"Thermax"	lb.	—		—
United, "Dixie" and "Kosmos"				
c.l. f.o.b. works, bags	lb.	.02¾	@	—
c.l. f.o.b. works, cases	lb.	.04¼	@	—
less c.l. f.o.b. works	lb.	.05¼	@	.07
"Velvetex"	lb.	.02½	@	.05

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85	@	24.50
Ammonia carbonate, lump	lb.	.10½	@	.12
Asbestine	ton	15.00	@	—
Barium carbonate (98-100%)	lb.	.05	@	—
Barium Dust	lb.	.05	@	.06
Barytes southern off-color	ton	10.00	@	18.00
Western prime white	ton	23.00	@	—
Basofor	lb.	.04½	@	—
Bentonite	lb.	.02	@	.03
Blanc fixe dry f.o.b. works	ton	60.00	@	65.00
Carrara filler	lb.	.01¾	@	.02
Catalpo (fact.)	lb.	.02	@	—
Chalk, precipitated				
Suprex white, extra lt.	ton	60.00	@	75.00
heavy	ton	45.00	@	55.00
Clay, Kaolin, domestic	ton	6.00	@	7.00
Aerfloted, Suprex	ton	6.50	@	8.00
Congaree	ton	9.00	@	—
Dark Blue Ridge	ton			
Dixie	ton			
Langford	ton			
Lexington	ton	10.00	@	22.00
Par	ton			
Tensulite		15.00	@	—
Cotton Flock	lb.	.08	@	.16
Glues, extra white	lb.	.15	@	.22
medium white	lb.	.12	@	.14
Kalite No. 1	ton	30.00	@	55.00
Kalite No. 3	ton	40.00	@	65.00
Magnesia, carbonate	lb.	.05¾	@	.06
Mica	lb.	.04	@	—
Rottonstone (powdered)	ton	23.50	@	28 00
Soapstone, powdered	ton	16.00	@	18.00
Starch, powdered	cwt.	2.50	@	2.60
Talc, domestic	ton	12.00	@	15.00
Pyrax A	ton			
Whiting, commercial	cwt.	.85	@	1.10
English cliffstone	cwt.	1.50	@	1.70
Sussex	ton			
Witco	ton	20.00	@	—
Zinc Carbonate	lb.	.10¼	@	—
Zinc Stearate	lb	.20½	@	.21

MINERAL RUBBER

Genasco (factory)	ton	30.00	@	43.00
Granulated M. R.	ton			
Hard Hydrocarbon	ton			
Parmr, solid	ton	23.00	@	28.00
Pioneer. MR, solid	ton	40.00	@	42.00
Pioneer-granulated	ton	50.00	@	52.00

SOFTENERS

Acids				
Nitric, 36 degrees	cwt.	5.00	@	5.25
Sulfuric, 66 degrees	cwt.	1.55	@	1.80
Tartaric, crystals	lb.	.23½	@	—
Acids, Fatty				
Laurex	lb.	.15	@	.16
Stearex	lb.	.08	@	.12
Stearic, double pressed	lb.	.08	@	.12
Alkalies				
Caustic Soda, 76%	cwt.	2.55	@	—
Soda Ash, 58% C.L.	cwt.	1.20	@	1.35
Oils				
Corn, refined, bbls.	lb.	—	@	.06¾
Cottonseed, crude	gal.	—	@	.04
Cycline Oil	gal.	.15	@	.28
Degras (c.l. 100 bbls.)	lb.	.02¾	@	—
Less c.l. (10-25 bbls.)	lb.	.03	@	—
Lots less than 10 bbls.	lb.	.03¼	@	—
Fluxrite	lb.	.05½	@	.06½
Palm Lagos	lb.	.04⅝	@	—
Niger	lb.	.02¾	@	.03
Para-Flux	gal.	.17	@	—
Petrolatum, light	lb.	.02½	@	—
Pigmentaroil	gal.	.13	@	.18
Pine, steam distilled	gal.	.59	@	.61
destructively distilled	gal.	.56	@	.58
Tackol	lb.	.08½	@	.18
Witco Palm Oil	lb.	.07½	@	—
Witco Softener (f.o.b. wks.)	lb.	.02	@	—
Resins and Pitches				
Pitch, Burgundy	lb.	.05	@	.06
coal tar	gal.	.05½	@	.06
pine, 200 lb. gr. wt. bbl.	bbl.	6.00	@	—
Rosin, grade K, 290 lb. bbl.	bbl.	5.50	@	—
Pigmentar	gal.	.13	@	.18
Tar Retort, 50 gal.	bbl.	9.50	@	10.00
Solvents				
Acetone, pure	lb.	.10	@	—
Alcohol, denatured, No. 1 bbls.	gal.	.30½	@	.41½
Benzol, 90%	gal.	.20	@	.22
Carbon, bisulfide	lb.	.05	@	.06
Carbon, tetrachloride	lb.	.05¼	@	.06
Dipentene	gal.	.31	@	.41
Dryolene (f.o.b. Okla.)	gal.	.10	@	.10½
Ethylene dichloride	lb.	.05	@	.06
Gasoline, steel bbls.	gal.	.16	@	
Naphtha, solvent	gal.	.26	@	.31
Rub-Sol (f.o.b. Okla.)	gal.	.09	@	—
Turpentine, spirits	gal.	.55	@	—
wood	gal.	.50	@	—
destructively distilled	gal.	.45	@	—
Waxes				
Beeswax, white	lb.	.30	@	.32
Carnauba	lb.	.25	@	.26
Ceresin, white	lb.	.10	@	.11
Montan, crude	lb.	.05	@	.06
Ozokerite, black	lb.	.24	@	.25
green	lb.	.26	@	.30
Paraffin (c.l.—f.o.b. N. Y.)				
Yellow crude scale	lb.	.02⅝	@	.03½
White crude scale 124/126	lb.	.02	@	.02½
Refined, 125/127, 138/140	lb.	.03	@	.07

ANTI-OXIDANTS

AgeRite, Gel	lb.			
Powder	lb.			
Resin	lb.			
White	lb.			
Albasan	lb.	.70	@	.75
Antox	lb.			
B-L-E	lb.	.57	@	.60
Flectol A and Flectol-B	lb.	.54	@	.62
Neozone	lb.			
Oxynone	lb.	.68	@	.80
Retardex	lb.	.35	@	.40
Stabilite	lb.	.57	@	.62
Stabilite Alba	lb.	.70	@	.75
VGB	lb.	.55	@	.60

SPECIALTIES

Aromatics- Rodo	lb.			
Para-Dors No. 5145	lb.	2.00	@	—
Sunproof	lb.	.35	@	.37½
Sponge Paste	lb.	—	@	.30
Tonox	lb.	.56	@	.60

SUBSTITUTES

Black	lb.	.06	@	.08
White	lb.	.07½	@	.12
Brown	lb.	.06½	@	.11

VULCANIZING INGREDIENTS

Sulfur Chloride (drums)	lb.	.04	@	—
Sulfur flour,				
Ref'n'd, 100% pure (bags)	cwt.	2.40	@	2.75
Commercial (bags	cwt.	1.75	@	2.10
Telloy	lb			
Vandex	lb			

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1922	301,076	101,843,188	15.10	4,809	1,921,828	17.84	296,267
1923	309,144	185,060,304	26.72	8,772	5,672,319	28.87	300,372
1924	328,056	174,231,331	23.71	10,309	6,057,637	26.23	317,747
1925	396,642	429,705,014	48.36	14,827	19,847,753	59.76	381,815
1926	413,338	505,817,807	54.63	17,671	22,470,583	56.77	395,667
1927	426,258	339,874,774	35.60	27,775	24,735,488	39.76	398,483
1928	439,731	244,854,973	25.03	32,159	18,128,361	25.17	407,572
1929	560,084	239,178,783	19.15	36,485	16,868,733	20.64	523,599
1930	482,082	139,134,330	12.89	30,205	9,316,205	13.77	451,877
1931	497,138	72,918,949	6.54	25,595	4,255,472	7.42	471,543
1932	409,584	31,936,459	3.47	20,929	2,015,612	4.30	388,655
1931:							
June	46,233	6,918,900	6.68	2,749	440,604	7.15	43,484
July	43,469	6,023,748	6.19	1,435	223,587	6.96	42,034
Aug.	38,669	5,138,404	5.93	2,324	345,953	6.65	36,345
Sept.	38,494	4,970,324	5.76	1,362	187,431	6.14	37,132
Oct.	41,131	4,803,582	5.21	1,527	203,574	5.95	39,604
Nov.	43,345	4,742,218	4.72	1,403	198,284	6.31	41,345
Dec.	53,536	5,610,120	4.68	2,462	326,382	5.91	51,070
1932:							
Jan.	33,221	3,387,505	4.55	1,524	185,466	5.43	31,697
Feb.	27,959	2,690,250	4.29	1,915	222,584	5.19	26,044
Mar.	45,197	4,251,801	4.19	2,227	240,128	4.84	42,970
April	37,903	3,181,343	3.74	2,128	196,934	4.53	35,775
May	34,182	2,798,914	3.71	1,505	144,561	4.30	32,677
June	40,808	2,647,085	2.89	1,981	134,336	3.02	39,136
July	32,306	2,102,915	2.91	2,030	179,699	3.95	30,276
August	33,449	2,027,045	2.71	1,339	128,952	4.29	32,110
Oct.	35,096	2,436,522	3.10	1,059	98,022	4.13	34,037
Nov.	28,908	2,263,469	3.48	1,745	158,618	4.06	27,163
Dec.	31,384	2,360,061	3.34	770	66,165	3.98	30,614
1933							
Jan.	29,822	2,213,828	3.03	1,403	109,916	3.49	28,419
Feb.	22,603	1,554,086	3.12	1,244	102,129	3.73	21,359
Mar.	27,936	1,867,657	2.98	1,127	86,216	3.42	26,809
Apr.	20,240	1,291,136	2.85	798	70,111	3.92	19,442
May	26,002	1,694,963	2.93	1,842	189,451	4.59	24,894
June	22,900	1,780,495	3.47	1,276	156,168	5.46	21,624
July	44,625	4,293,111	4.29	1,419	219,945	6.92	43,206

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex (1): Tons	Liquid Latex (1): Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,853	3,537,810
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,388	4,680,386
1927	5,018	2,674,957	582	447,246	7,785	2,448,657	1,116	876,077
1928	3,075	1,755,685	731	430,855	7,552	2,540,059	4,167	2,185,579
1929	1,231	545,175	728	566,964	8,208	2,458,136	3,728	1,787,997
1930	1,096	347,388	501	422,684	5,907	1,403,244	4,449	1,506,804
1931	—	—	1,208	411,692	5,777	1,019,010	4,650	884,355
1932	—	—	708	147,403	4,607	616,596	5,085	601,999
1932:								
Aug.	—	—	36	8,385	367	46,926	540	59,178
Sept.	—	—	11	2,261	216	27,265	297	46,380
Oct.	—	—	84	17,451	349	48,816	711	69,058
Nov.	—	—	134	15,983	163	20,296	526	70,785
Dec.	—	—	22	5,209	276	36,298	632	79,250
1933								
Jan.	—	—	53	7,815	357	40,586	841	100,900
Feb.	—	—	12	2,923	391	52,171	367	46,037
Mar.	—	—	45	11,963	437	56,262	539	55,731
Apr.	—	—	7	2,054	210	26,856	794	80,794
May	—	—	35	9,869	463	55,560	734	71,008
June	—	—	759	1,514,296	466	61,229	604	66,827
July	—	—	238	76,141	638	79,049	618	85,636

(1) Latex import figures not available before 1924. Weight given in pounds of dry rubber contained in latex.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)

Figures on Monthly Basis

	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	32,196	31,518	34,403	43,002	36,194	28,557	27,962	21,661
Feb.	31,136	30,137	33,702	41,594	33,302	28,797	30,011	21,638
Mar.	32,936	36,141	35,688	44,730	35,540	32,788	27,828	18,047
Apr.	32,696	35,871	32,772	47,521	39,686	33,321	25,953	26,226
May	29,364	34,592	37,333	49,233	39,386	37,817	30,597	44,580
June	28,598	33,801	37,676	43,227	34,195	37,916	41,475	51,326
July	27,577	29,219	37,407	41,526	29,508	31,397	29,976	50,184
Aug.	34,533	33,460	42,927	38,274	30,850	27,586	22,372	—
Sept.	32,904	27,214	39,882	34,707	25,515	23,638	22,491	—
Oct.	29,936	26,790	40,857	34,800	27,516	22,277	21,018	—
Nov.	28,080	26,792	37,461	27,659	23,691	22,943	21,910	—
Dec.	26,293	25,492	31,232	23,531	21,687	21,409	16,990	—
Totals	366,149	371,027	441,340	469,804	375,980	348,986	313,122	—

Figures on Quarterly Basis

Quarter	1926	1927	1928	1929	1930	1931	1932	1933
Jan./Mar.	94,301	99,216	103,558	128,565	101,610	89,652	85,309	64,211
Apr./June	87,109	103,242	103,500	139,292	112,229	107,755	92,643	121,445
July/Sept.	93,793	89,210	117,573	113,746	85,261	83,632	72,523	—
Oct./Dec.	83,212	80,860	117,597	84,872	72,020	65,645	64,145	—
Totals	358,415	372,528	442,227	466,475	371,120	346,684	314,620	—

Note—The quarterly figures are generally regarded as the most authentic; the monthly figures may be accepted as preliminary.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Consumption: Production	Consumption: Tons	Consumption: % to Crude	Stocks*
1922	57,834	54,458	19.3	.....
1923	74,766	69,534	22.7	.....
1924	80,079	76,072	22.4	.....
1925	132,930	137,105	35.6	13,203
1926	180,582	164,500	45.9	23,213
1932:				
Jan.	8,753	8,440	30.2	18,712
Feb.	8,731	8,332	27.7	18,659
Mar.	8,613	7,420	26.7	19,721
Apr.	5,561	5,555	21.6	21,525
May	5,024	6,070	20.8	18,889
June	5,923	7,031	18.0	16,870
1933:				
Jan.	5,245	4,506	20.8	15,117
Feb.	4,530	4,087	18.9	15,403
Mar.	3,847	3,454	19.1	15,496
Apr.	4,617	4,407	16.8	14,370
May	8,366	7,770	17.4	13,734
June	10,591	9,674	18.8	13,231

Year	Consumption: Production	Consumption: Tons	Consumption: % to Crude	Stocks*
1927	189,144	178,471	47.6	24,980
1928	208,516	223,000	50.4	24,785
1929	218,954	226,588	48.4	27,464
1930	157,967	153,497	40.8	22,000
1931	133,351	124,126	33.9	19,257
July	5,417	5,131	18.1	16,333
Aug.	3,264	4,382	18.6	14,629
Sept.	5,308	5,235	23.2	14,059
Oct.	6,605	5,494	26.1	13,911
Nov.	6,542	5,234	23.9	14,047
Dec.	5,626	3,968	23.4	15,202
July	12,049	10,317	20.6	14,108
Aug.	.....	.....	.....	.....
Sept.	.....	.....	.....	.....
Oct.	.....	.....	.....	.....
Nov.	.....	.....	.....	.....
Dec.	.....	.....	.....	.....

* Stocks on hand at the end of month or year.
(Rubber Manufacturers' Association figures raised to 100%)

U. S. Consumption of Gasoline

(In Thousands of Barrels of 42 Gallons)

	1931	1932	1933		1931	1932	1933
January	26,844	26,063	26,510	July	39,459	31,317	34,458
February	26,133	25,344	23,312	August	39,459	35,207	.....
March	31,037	29,451	28,227	September	36,670	33,645	.....
April	33,400	30,252	30,176	October	35,051	32,255	.....
May	35,716	31,574	33,999	November	30,640	30,294	.....
June	38,375	38,766	37,710	December	30,529	27,191	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave
1931																																
June	6⅝	6⅝	6⅝	6⅝	6½	6½	—	6¼	6¼	6⅛	6⅛	6⅛	6⅛	—	6⅛	6⅛	6⅛	6⅛	6⅛	6¼	6⅛	6⅝	6¼	6¼	6½	6⅝	7	—	6⅝	—	—	6⅝
July	6¾	6¾	6¾	6¾	—	6¾	6¾	6½	6½	6⅝	6⅝	6½	6½	6⅝	6⅝	6⅝	6⅝	6⅝	—	6⅝	6⅝	6⅝	6¼	6¼	6⅛	—	6½	6	5⅝	5⅝	—	6⅛
August	5¾	5¾	5¾	5⅝	5⅝	5⅝	5½	5½	5⅝	5⅝	5⅝	5½	5⅝	5⅝	5¾	5¾	5¾	5¾	5¾	5⅝	5¾	5¾	—	5¼	5¼	5¼	5½	5⅛	5¼	4⅝	—	5⅛
September	5¼	5¼	5¼	5¼	—	4⅞	4⅞	—	5	5	5	5	5	5	5	5	5	5	5¼	5¼	5	5	5	5	4⅞	4⅝	4⅝	4⅝	4⅝	4⅝	—	4⅞
October	4¾	4¾	4¾	—	4⅞	4⅞	4⅝	5	5	5	5	5	5	5	5	5	5	5	5¼	5¼	5⅛	5	5	4⅞	4⅞	4⅝	4½	4½	4½	4½	—	4⅝
November	—	4½	—	4½	4⅝	4⅝	—	4⅝	5	—	4⅝	4⅝	4⅝	—	4⅝	4½	4½	4½	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	—	—	5	5	5	—	4⅝
December	4⅝	4⅝	4⅝	4⅝	4½	—	—	4⅝	4⅝	4⅝	4⅝	4⅝	—	4⅝	—	—	—	4⅝	5⅛	4⅝	4⅞	4⅞	4⅝	4⅝	4⅝	—	—	—	—	—	—	—	4⅝
1932																																
January	—	—	—	—	4½	4⅝	4⅝	4⅝	4⅝	—	4	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4¼	4¼	4⅝	4⅝	4⅝	4¼	4½
February	4⅝	4⅝	4⅝	4⅝	4¼	4¼	4¼	4¼	4¼	4¼	4	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4	4	4	4	4	4	3⅝	3⅝	3⅝	3⅝	3⅝	—	4
March	3½	3½	3½	3½	3½	3½	3½	3½	3½	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅛	3¼
April	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
May	—	3	3	3¼	3¼	4	4	4	4	3½	3½	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾	3½
June	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	—	4	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝
July	2⅝	2⅝	—	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝	2⅝
August	3¼	3¼	3¼	3¼	3¼	3¼	3½	3½	3½	3½	4	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½
September	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼	4¼
October	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝	3⅝
November	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	—	3⅛
December	3⅛	3⅛	3⅛	3⅛	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1933																																
January	—	—	—	3¾	3¼	3⅛	2¾	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛	3⅛
February	—	2¾	2¾	2¾	3	3	2¾	—	3	2¾	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March	2¾	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
April	2⅝	—	2⅝	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
May	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝	4⅝
June	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝	6⅝
July	6½	—	6½	6½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
August	7⅝	7⅝	—	8	7⅝	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
September	7¼	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1910-1929

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1910	206.60	1914	65.33	1918	60.15	1922	17.50	1926	48.50
1911	141.30	1915	65.85	1919	48.70	1923	29.45	1927	37.72
1912	121.60	1916	72.50	1920	36.30	1924	26.20	1928	22.48
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.55

Average Monthly Price per Pound Since 1927

Month	1927 Cents	1928 Cents	1929 Cents	1930 Cents	1931 Cents	1932 Cents	1933 Cents
Jan.	38.75	40.25	20.14	15.24	8.34	4.38	3.08
Feb.	38.25	32.75	23.97	15.85	7.70	4.03	2.95
Mar.	41.04	26.82	24.55	15.34	7.71	3.35	3.01
Apr.	40.86	18.97	21.18	14.93	6.43	3.02	3.56
May	40.76	18.99	21.46	14.24	6.49	3.09	4.95
June	37.25	19.59	20.64	12.45	6.35	2.66	6.15
July	34.87	19.40	21.30	11.24	6.37	2.89	8.01
Aug.	35.12	19.46	20.59	9.96	5.38	3.63	7.31
Sept.	33.67	18.47	20.37	8.28	5.08	3.84	—
Oct.	34.32	18.83	19.67	8.20	4.87	3.65	—
Nov.	37.58	18.26	16.62	9.01	4.65	3.44	—
Dec.	40.63	17.97	16.12	9.05	4.64	3.24	—
Average for Year	37.72	22.48	20.55	11.98	6.17	3.49	—

London Closing Prices of Ribbed Smoked Sheet

(In Pence Per Pound)

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1	$3\frac{1}{2}$	$3\frac{1}{16}$	$3\frac{13}{32}$	$3\frac{3}{4}$	17	$3\frac{7}{32}$	$4\frac{7}{16}$	$3\frac{3}{4}$	—
2	$3\frac{3}{8}$	—	$3\frac{13}{32}$	—	18	—	$4\frac{1}{2}$	$3\frac{3}{4}$	—
3	$3\frac{13}{32}$	$3\frac{1}{8}$	$4\frac{1}{32}$	—	19	$3\frac{7}{32}$	$4\frac{11}{32}$	—	—
4	—	$3\frac{1}{32}$	$3\frac{11}{32}$	$3\frac{13}{32}$	20	$3\frac{1}{32}$	$4\frac{3}{8}$	—	—
5	—	$3\frac{1}{32}$	—	$3\frac{13}{32}$	21	$3\frac{1}{4}$	4	$3\frac{13}{32}$	—
6	$3\frac{7}{32}$	$3\frac{1}{32}$	—	$3\frac{11}{32}$	22	$3\frac{13}{32}$	$3\frac{13}{32}$	$3\frac{11}{32}$	—
7	$3\frac{11}{32}$	$3\frac{1}{32}$	—	$3\frac{5}{16}$	23	$3\frac{11}{32}$	—	$3\frac{3}{4}$	—
8	$3\frac{7}{32}$	$3\frac{1}{32}$	4	$3\frac{13}{32}$	24	$3\frac{7}{32}$	$4\frac{3}{32}$	$3\frac{11}{32}$	—
9	$3\frac{1}{32}$	—	$3\frac{13}{32}$	$3\frac{7}{32}$	25	—	$4\frac{1}{4}$	$3\frac{13}{32}$	—
10	$3\frac{11}{32}$	$3\frac{13}{32}$	4	—	26	$3\frac{3}{32}$	$4\frac{7}{32}$	—	—
11	—	$3\frac{13}{32}$	$3\frac{13}{32}$	—	27	$3\frac{13}{32}$	$4\frac{15}{32}$	—	—
12	$3\frac{3}{8}$	$3\frac{13}{32}$	—	—	28	$3\frac{11}{32}$	$3\frac{13}{32}$	$3\frac{13}{32}$	—
13	$3\frac{11}{32}$	$3\frac{7}{16}$	—	—	29	$3\frac{13}{32}$	$3\frac{3}{4}$	$3\frac{3}{4}$	—
14	$3\frac{7}{32}$	$3\frac{1}{16}$	$3\frac{13}{32}$	—	30	$3\frac{13}{32}$	—	$3\frac{3}{4}$	—
15	$3\frac{3}{32}$	$3\frac{7}{32}$	$3\frac{13}{32}$	—	31	—	$3\frac{3}{4}$	$3\frac{3}{4}$	—
16	$2\frac{15}{16}$	—	$3\frac{11}{32}$	—					

Average Monthly Price Per Pound

Month	1930 Pence	1931 Pence	1932 Pence	1933 Pence	Month	1930 Pence	1931 Pence	1932 Pence	1933 Pence
Jan.	7.471	4.160	3.052	2.264	Aug.	4.880	2.385	2.654	3.811
Feb.	7.948	3.823	2.760	2.093	Sept.	4.075	2.524	2.485	—
Mar.	7.595	3.822	2.047	2.099	Oct.	4.023	2.898	2.425	—
Apr.	7.391	3.082	1.876	2.323	Nov.	4.440	2.890	2.518	—
May	6.926	3.035	1.825	2.966	Dec.	4.516	3.115	2.444	—
June	6.195	3.082	1.750	3.392	Average for Year	5.926	3.155	2.434	—
July	5.648	3.048	1.875	3.860					

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Day of Month	July	Aug.	Sept.	Day of Month	July	Aug.	Sept.	Day of Month	July	Aug.	Sept.
1	10.30	10.40	9.45	11	10.65	9.30	——	21	10.10	9.35	——
2	——	10.45	——	12	11.55	9.20	——	22	10.20	9.50	——
3	——	10.30	——	13	11.40	——	——	23	——	9.30	——
4	——	10.15	——	14	11.60	9.00	——	24	10.55	9.30	——
5	10.25	10.05	9.10	15	11.60	8.85	——	25	10.50	9.55	——
6	10.50	——	9.30	16	——	8.65	——	26	10.65	9.60	——
7	10.30	——	9.20	17	11.65	9.30	——	27	10.90	——	——
8	10.25	9.60	9.00	18	11.75	9.25	——	28	10.50	9.65	——
9	——	9.85	8.85	19	11.35	9.35	——	29	10.50	9.65	——
10	10.75	9.65	——	20	10.55	——	——	30	——	9.55	——
								31	10.00	9.45	——

Average Monthly Price Per Pound

Month	1930 Cents	1931 Cents	1932 Cents	1933 Cents	Month	1930 Cents	1931 Cents	1932 Cents	1933 Cents
Jan.	17.21	10.27	6.65	6.28	Aug.	12.03	7.21	7.43	9.55
Feb.	15.62	10.96	6.85	6.05	Sept.	10.85	6.52	6.30	—
Mar.	15.13	10.90	6.86	6.39	Oct.	10.63	6.32	6.30	—
Apr.	16.39	10.19	6.16	7.02	Nov.	10.96	6.44	6.22	—
May	16.43	9.38	5.72	8.64	Dec.	10.92	6.24	6.00	—
June	14.48	9.05	5.22	9.47	Average for Year	13.57	8.56	6.41	—
July	13.10	9.28	5.87	10.76					

*Exchanges closed due to Bank Moratorium.

World Stocks of Crude Rubber

ON HAND OR AFLOAT TO THE U. S.

At End of	ON HAND 1931	ON HAND 1932	ON HAND 1933	AFLOAT 1931	AFLOAT 1932	AFLOAT 1933	ON HAND AND AFLOAT 1931	ON HAND AND AFLOAT 1932	ON HAND AND AFLOAT 1933
Jan.	209,487	322,860	396,376	56,187	42,234	32,539	265,674	365,094	428,915
Feb.	212,833	322,711	381,794	63,680	51,728	32,898	276,513	373,845	414,692
Mar.	217,804	334,566	390,135	63,133	44,190	29,531	280,937	378,756	419,666
Apr.	228,382	343,099	382,167	56,700	40,387	30,745	285,082	383,486	412,912
May	220,799	346,231	364,623	73,564	50,453	43,342	294,363	396,684	407,965
June	225,536	345,702	333,954	69,421	43,079	63,608	294,957	388,781	397,562
July	234,822	345,927	326,609	66,873	37,894	57,435	301,695	383,821	384,044
Aug.	240,816	357,342	.....	61,469	41,282	.....	302,285	398,624	.....
Sept.	254,324	365,789	.....	62,420	46,188	.....	316,744	411,977	.....
Oct.	278,456	373,823	.....	68,427	40,176	.....	341,883	413,999	.....
Nov.	292,493	377,996	.....	77,443	40,876	.....	369,936	418,875	.....
Dec.	322,826	388,229	.....	53,940	38,360	.....	376,766	426,589	.....

(Rubber Manufacturers' Association figures raised to 100%)

STOCKS IN GREAT BRITAIN

Stocks in London

(No. of Tons in Wharves and Warehouses, including Latex)

At end of	1931	1932	1933	At end of	1931	1932	1933
Jan.	81,093	67,166	36,481	July	81,317	48,842	41,187
Feb.	82,265	65,942	37,182	Aug.	81,560	47,079	.....
Mar.	84,786	64,280	40,845	Sept.	79,692	44,942	.....
Apr.	86,831	61,848	40,911	Oct.	76,778	42,327	.....
May	86,683	56,089	41,998	Nov.	73,911	40,606	.....
June	83,071	51,009	43,032	Dec.	69,470	37,407	.....

At End of Recent Weeks

	First Saturday	Second Saturday	Third Saturday	Fourth Saturday	Fifth Saturday
1933					
February	37,188	37,396	37,559	37,603	
March	38,303	38,522	39,400	40,481	
April	40,845	40,498	40,019	40,547	41,234
May	41,478	41,695	41,843	41,969	
June	42,457	42,723	43,361	44,043	
July	43,748	43,319	42,745	42,046	41,161
August	41,211	40,544	40,166	39,237	
September	39,472				

Stocks in Liverpool

1933				
February	52,232	52,434	52,799	52,955	
March	53,850	53,531	53,716	53,692	
April	53,989	54,305	54,762	54,521	54,336
May	55,148	56,139	57,117	56,795	
June	57,560	58,560	59,326	59,272	
July	59,560	59,372	59,135	59,901	58,864
August	58,540	58,391	58,050	57,508	
September	57,266				

STOCKS IN PENANG AND SINGAPORE

(Stocks held by Dealers—Quantities in Long Tons)

End of	1930	1931	1932	1933	End of	1930	1931	1932	1933
Jan.	39,727	48,802	48,850	22,525	July	45,459	51,203	17,017	36,972
Feb.	44,371	49,283	46,954	21,530	Aug.	48,132	48,971	20,649	.....
Mar.	45,657	49,590	46,591	24,594	Sept.	44,015	47,025	20,415	.....
Apr.	48,473	45,868	39,663	25,460	Oct.	39,930	52,132	23,158	.....
May	44,715	44,278	38,690	29,822	Nov.	41,674	46,497	25,419	.....
June	42,451	47,517	19,770	34,676	Dec.	45,963	45,795	25,341	.....

STOCKS IN OTHER CENTRES

End of 1932:	Malaya Mainland	Afloat for Europe	Holland	Colombo	Para and Manaos
Oct.	38,125	19,020	2,208	3,219	6,012
Nov.	36,363	21,860	2,229	3,565	5,530
Dec.	40,222	24,430	2,170	3,844	5,552
1933:					
Jan.	38,844	25,080	2,143	4,662	5,676
Feb.	37,323	28,540	2,033	4,210	6,006
Mar.	33,494	26,180	2,183	3,779	5,780
Apr.	33,391	27,710	2,214	3,428	5,204
May	32,613	24,090	1,534	3,177	4,790
June	35,919		1,147	2,913	4,321
July	35,020				3,830

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total	Per Cent Balloons		Total	Per Cent Balloons
1923	23,140,620	0.6	1928	24,247,282	81.6
1924	21,863,311	19.7	1929	24,141,502	80.3
1925	26,001,664	66.8	1930	17,364,096	80.1
1926	24,199,524	78.8	1931	11,253,800	76.7
1927	19,700,003	79.1	1932	6,004,252	78.7
1933:			1933:		
January	727,308	79.1	July	900,227	—
February	579,789	—	August	960,795	—
March	846,755	—	September	———	—
April	898,318	—	October	———	—
May	938,083	—	November	———	—
June	1,015,181	—	December	———	—

U. S. Tire and Tube Statistics

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Figures for Recent Years

	1925	1926	1927	1928	1929	1930	1931	1932
Production	60,845	61,237	64,439	77,944	68,726	50,965	48,739	40,085
Shipments	59,262	59,002	64,059	74,296	69,395	53,638	48,151	40,260
Inventory[2]	8,142	10,456	10,264	13,624	11,838	9,003	7,775	7,644

Figures for Recent Months

	PRODUCTION 1931	PRODUCTION 1932	PRODUCTION 1933	SHIPMENTS 1931	SHIPMENTS 1932	SHIPMENTS 1933	INVENTORY 1931	INVENTORY 1932	INVENTORY 1933
Jan.	3,675	3,462	2,258	3,744	3,253	2,597	8,957	7,912	7,237
Feb.	3,985	3,871	2,339	3,402	2,553	2,292	9,536	9,172	7,377
Mar.	4,663	3,671	2,038	4,122	2,954	2,092	10,014	9,878	7,290
Apr.	4,944	3,517	3,123	4,932	3,698	3,654	10,031	9,846	6,778
May	5,679	3,820	5,189	5,415	4,258	5,180	10,312	9,379	6,760
June	5,672	5,643	6,100	5,572	10,065	6,305	10,447	4,999	6,615
July	4,926	3,617	.....	5,462	2,404	.....	9,919	6,203	.....
Aug.	3,906	3,089	.....	4,960	2,655	.....	8,896	6,659	.....
Sept.	3,172	2,539	.....	3,932	3,082	.....	8,158	6,096	.....
Oct.	2,974	2,569	.....	2,852	1,799	.....	8,300	6,876	.....
Nov.	2,500	2,304	.....	2,887	1,711	.....	7,919	7,454	.....
Dec.	2,643	1,983	.....	2,781	1,819	.....	7,775	7,644	.....

AUTOMOBILE INNER TUBES

Figures for Recent Years

	1925	1926	1927	1928	1929	1930	1931	1932
Production	82,614	76,618	70,823	80,180	68,829	52,420	48,333	36,801
Shipments	81,004	71,591	72,896	77,127	70,592	54,938	50,021	37,935
Inventory[2]	11,313	16,200	13,692	16,117	12,807	9,999	7,922	6,749

Figures for Recent Months

	PRODUCTION 1931	PRODUCTION 1932	PRODUCTION 1933	SHIPMENTS 1931	SHIPMENTS 1932	SHIPMENTS 1933	INVENTORY 1931	INVENTORY 1932	INVENTORY 1933
Jan.	3,623	3,308	2,093	4,062	3,529	2,535	9,439	7,719	6,197
Feb.	3,916	3,281	2,224	3,400	2,728	2,102	9,921	8,760	6,357
Mar.	4,450	3,502	1,883	3,789	2,686	1,902	10,475	9,448	6,369
Apr.	4,617	3,225	2,853	4,636	3,385	3,051	10,413	9,441	6,189
May	5,413	3,409	4,700	5,281	3,867	4,463	10,459	8,913	6,382
June	5,358	5,279	5,448	5,397	9,019	5,778	10,504	5,174	6,097
July	4,955	2,937	.....	5,831	2,160	.....	9,589	5,975	.....
Aug.	4,435	2,748	.....	5,301	2,503	.....	8,774	6,127	.....
Sept.	3,449	2,601	.....	4,150	3,098	.....	8,095	5,753	.....
Oct.	3,077	2,187	.....	2,813	1,658	.....	8,321	6,214	.....
Nov.	2,443	2,005	.....	2,594	1,578	.....	8,119	6,662	.....
Dec.	2,597	1,779	.....	2,767	1,724	.....	7,922	6,749	.....

(1) **Rubber Manufacturers' Association figures, raised to 100%. The Association estimates its figures to be 75% complete up until 1929 and 80% complete beginning with 1929, and that basis has been accepted when preparing the statistics in this table.**

(2) **Held by manufacturers at end of period indicated.**

Automobile Production

	United States Total	United States Passenger Cars	United States Trucks	Canada Total	Canada Passenger Cars	Canada Trucks	Grand Total
1926	4,298,799	3,808,753	490,046	205,002	164,483	40,609	4,503,891
1927	3,393,887	2,938,868	453,019	179,426	146,850	32,556	3,573,313
1928	4,357,384	3,826,613	530,771	242,382	196,737	45,645	4,599,944
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932							
Apr.	148,326	120,937	27,389	6,810	5,660	1,150	155,136
May	184,295	157,756	26,539	8,221	7,269	952	193,370
June	183,106	160,338	22,768	7,112	6,308	804	190,204
July	109,143	94,705	14,438	7,472	6,773	699	118,611
Aug.	90,325	75,907	14,418	4,067	3,166	901	94,391
Sept.	84,150	64,748	19,402	2,342	1,741	601	86,483
Oct.	48,702	35,107	13,595	2,923	2,361	562	51,857
Nov.	59,557	47,532	12,025	2,204	1,669	535	61,760
Dec.	107,353	86,149	21,204	2,139	1,561	578	109,542
Total	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933							
Jan.	130,044	108,326	21,718	3,358	2,921	437	133,402
Feb.	106,825	91,492	15,333	3,298	3,025	273	110,123
Mar.	117,949	99,885	18,064	6,632	5,927	705	124,581
Apr.	180,667	153,350	27,317	8,255	6,957	1,298	189,922
May	218,303	184,698	33,605	9,396	8,024	1,372	227,669
June	253,322	211,483	41,839	7,323	6,005	1,318	260,645
July	233,088	195,023	38,065	6,540	5,322	1,218	239,628

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA[1]							DUTCH EAST INDIES[3]							
	Gross Exports	Gross Exports Minus Imports	Imports	Ceylon[2]	India & Burma[3]	Sarawak[4]	British North Borneo[3]	Siam[4]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China[3]	Amazon Valley	All Other[5]	World Total[7]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,976	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1932:															
Mar.	39,903	6,658	33,245	3,462	284	501	460	217	4,946	6,863	6,299	774	715	77	57,843
Apr.	36,670	4,682	31,988	3,210	365	459	345	130	6,722	6,090	4,935	962	487	99	55,792
May	40,297	5,677	34,620	3,824	304	595	344	118	6,552	6,551	6,012	964	416	278	60,578
June	36,566	5,665	30,901	3,444	359	481	345	166	5,610	7,516	5,507	1,218	394	139	56,080
July	40,723	5,346	35,377	3,501	99	442	400	184	5,779	6,257	6,145	1,233	232	141	59,790
Aug.	39,327	7,371	31,956	4,717	129	506	400	300	4,803	4,882	7,244	1,088	303	49	56,377
Sept.	41,973	8,869	33,104	5,238	122	614	400	340	3,858	6,485	7,664	1,621	318	78	59,733
Oct.	37,931	9,798	28,133	2,945	139	583	350	428	4,022	7,051	8,944	1,147	414	247	54,403
Nov.	40,098	10,072	30,026	4,146	185	683	350	371	4,368	6,250	9,080	809	1,164	156	57,588
Dec.	40,118	10,089	30,029	5,801	367	644	350	406	4,683	7,066	8,594	1,211	824	150*	59,493
1933:															
Jan.	46,599	7,857	38,742	4,602	318	590	458	305	4,766	5,630	6,849	1,957	554	125*	58,887
Feb.	37,564	6,167	31,397	5,064	304	541	458	368	4,895	5,119	6,081	895	620	125*	55,867
Mar.	42,059	7,964	34,095	4,905	389	571	458	304	5,092	6,466	6,999	1,102	995	125*	61,501
Apr.	36,752	7,758	28,994	4,582	272	624	500*	235	5,226	5,969	8,147	1,122	556	125*	56,352
May	42,902	13,664	29,238	4,643	475	1,091	500*	359	6,782	7,298	13,195	1,436	918	125	66,060
June	41,411	16,538	24,873	5,198	377	1,149	500*	632	7,352	6,654	14,779	1,126*	704	125*	63,469
July	50,531	18,772	31,759	4,551		1,358	500*	797	7,367	8,580	16,534	1,301	913	125*	
Aug.	52,266	17,869	34,397	5,692											

(1) Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, 3,263 in 1926, 2,439 in 1927, 1,437 in 1928, 2,670 in 1929, and 1,274 in 1930. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments were equivalent to 18 tons in 1923, 93 tons 1924, 6 tons 1925, 20 tons 1926, about ½ ton in 1927, and 1 ton in 1928, and practically none in 1929, 1930 and 1931. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons 1924, 2,239 tons 1925, 44 tons in 1926, 84 tons in 1927, 1,459 tons in 1928, 1,302 tons in 1929, and 2,656 tons in 1930. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Belgium and Netherlands, and includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. *Figure is provisional; final figure will be shown when available.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States[1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,272	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	3,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,128	599,771
1929	528,608	122,675	55,092	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,689	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	45,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1932:															
Feb.	26,483	5,930	2,898	4,356	1,723	6,781	1,189	2,981	758	506	500	708	313	306	55,382
Mar.	43,361	3,585	2,482	3,436	2,588	5,398	1,423	2,745	1,211	721	112	456	359	644	68,521
Apr.	36,326	6,826	2,956	2,737	1,600	3,684	1,083	764	1,549	847	348	474	417	1,259	61,870
May	32,818	1,110	2,277	3,447	1,416	3,917	1,033	3,743	2,048	617	286	707	272	350	51,821
June	39,136	1,853	3,666	3,405	2,834	2,834	1,534	5,291	1,421	449	127	578	196	280	63,604
July	30,494	4,082	3,125	3,380	1,529	2,544	1,116	1,735	624	723	—214	784	258	1,207	51,387
Aug.	32,650	6,671	4,919	4,006	970	3,390	1,615	1,740	751	1,211	—66	611	210	557	59,235
Sept.	26,865	3,942	5,845	3,674	2,770	5,878	971	1,376	625	694	103	534	267	406	54,220
Oct.	34,748	2,927	4,715	4,177	1,207	5,653	510	1,853	569	627	553	537	489	986	59,551
Nov.	27,689	4,950	3,830	3,577	1,593	4,563	1,265	1,481	1,653	1,035	275	489	631	650	53,681
Dec.	31,246	1,182	3,205	4,623	941	5,603	2,103	3,720	745	1,298	348	544	485	2,602	57,645
1933:															
Jan.	29,260	3,277	5,858	4,241	1,189	7,611	3,005	1,558	1,275	1,388	308	640	252	838	60,700
Feb	22,970	7,102	6,603	4,460	1,175	8,508	994	2,820	2,001	1,670	375	564	132	681	60,055
Mar.	27,348	8,883	6,093	4,425	1,114	6,035	1,604	2,088	1,904	952	282	649	340	688	62,405
Apr.	20,236	7,765	6,308	4,805	555	5,495	2,215	2,274	1,580	882	163	606	281	400	53,565
May	24,894	11,085	4,144	4,622	1,704	5,289	1,278	1,691	425	710	—525	536	433	432	56,718
June	22,228	8,739	4,056	3,639	1,441	3,330		2,000	613	469	—519	772	541	400	
July	43,824	3,961	3,774			1,460			2,347			486			

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]United States imports of guayule are included in this compilation. *Figure is provisional; final figure will be shown immediately it becomes available.